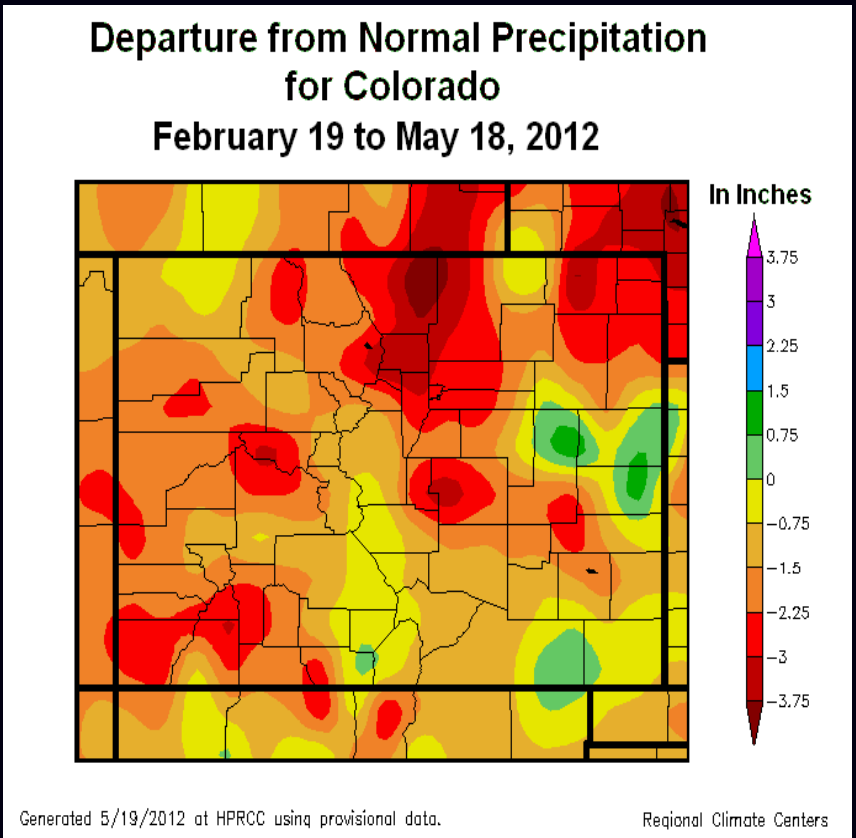
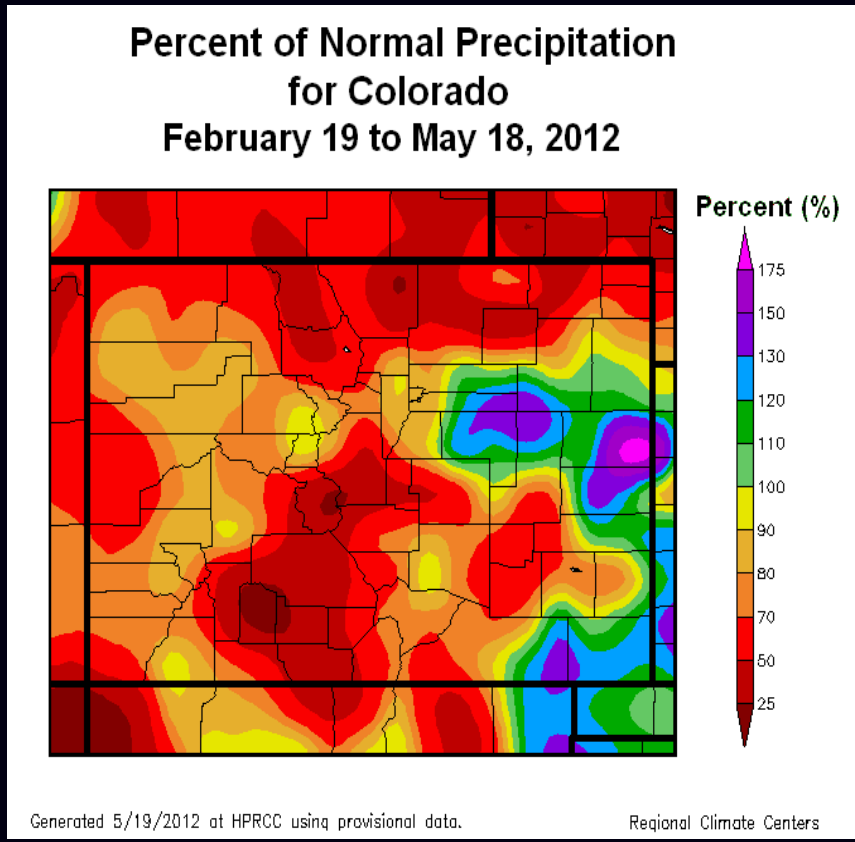
The June-July-August 2012 Outlook For The Front Range Urban Corridor and the Rest of Colorado

Mike Baker
National Weather Service
Boulder, Colorado

May 26, 2012
Revised

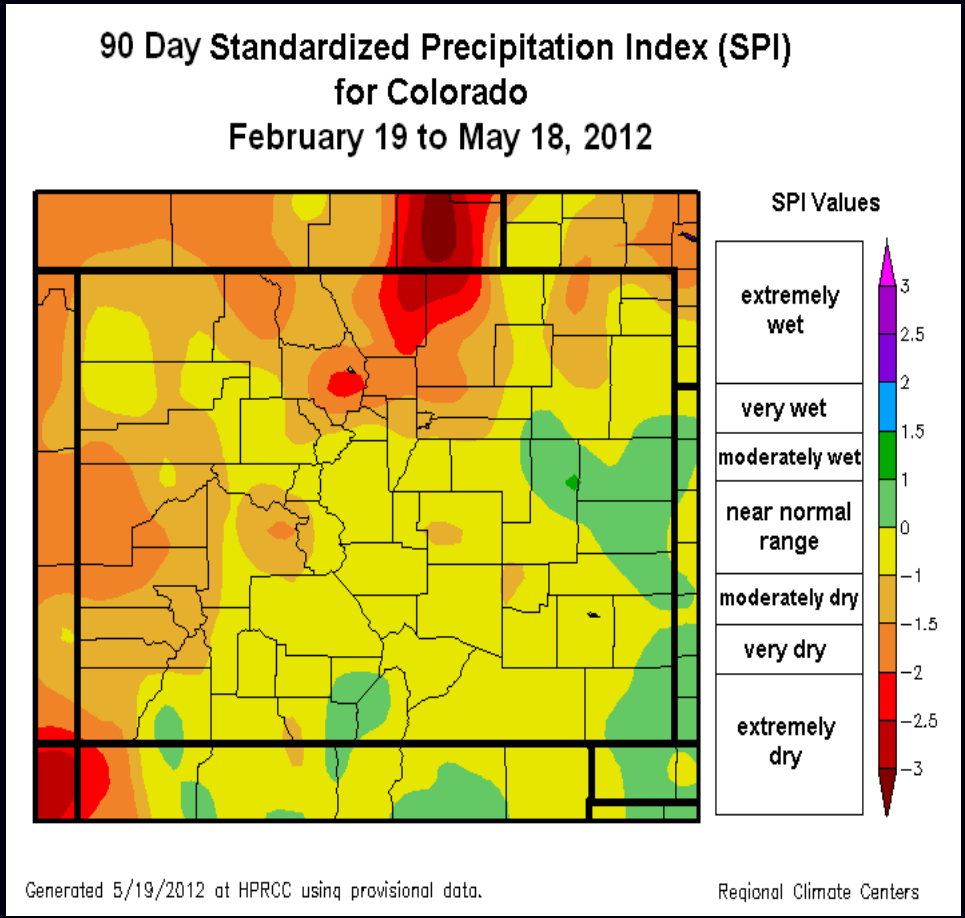

LARAMIE
HIAWATHA
KIMBALL
CRAIG
COLORADO
STERLING
RANGELY
KREMMLING
WRAY
DENVER
The
Past 90 Days
GRAND
JUNCTION
FLAGLER
MOAB
MONTROSE
CHEYENNE
WELLS
PUEBLO
SAGUACHE
DOVE
CREEK
LAMAR
DURANGO
ALAMOSA
SPRINGFIELD
TRINIDAD
FARMINGTON





Precipitation in Colorado during the 90-day period February 19 to May 18, 2012, was below to much below average, with a few exceptions. Departures from normal ranged from nearly 4 inches below average along the northern Front Range centered in Larimer County, to just under an inch above average in Cheyenne and Kit Carson counties in east central Colorado.

Precipitation along the state's northern border and over the higher terrain in south central Colorado was as much as 25 to 70 percent of normal. Conversely, portions of east central and southeast Colorado saw precipitation totals as much as 150 percent of normal.



The Standardized Precipitation Index (SPI) for this same 90-day period, reveals dry to very dry conditions across most of Colorado, with extremely dry soils in eastern Larimer and northwest Weld counties in north central Colorado.

Exceptions include portions of east central and southeast Colorado where near normal to moderately wet soil conditions dominated during this 90-day period.

The SPI was developed to monitor potential short term agricultural and long-term hydrological drought conditions. The SPI is a probability index that considers only precipitation.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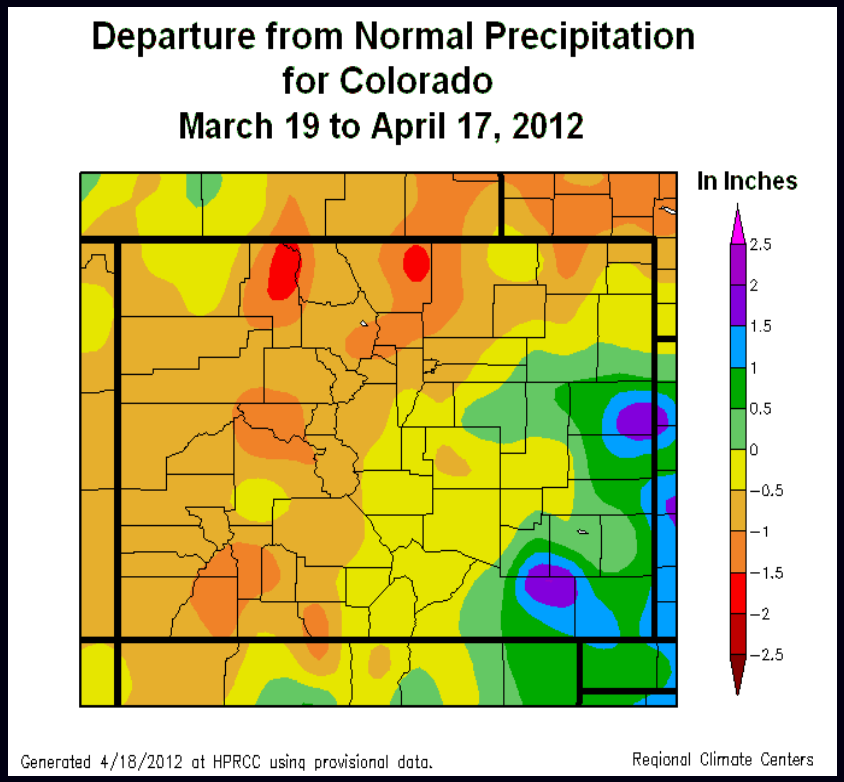
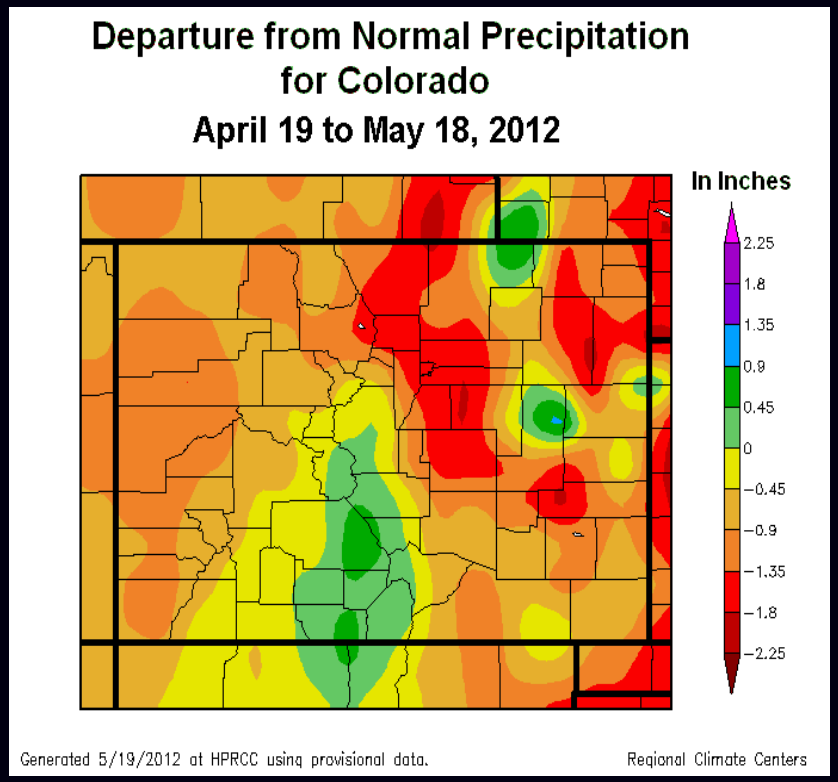
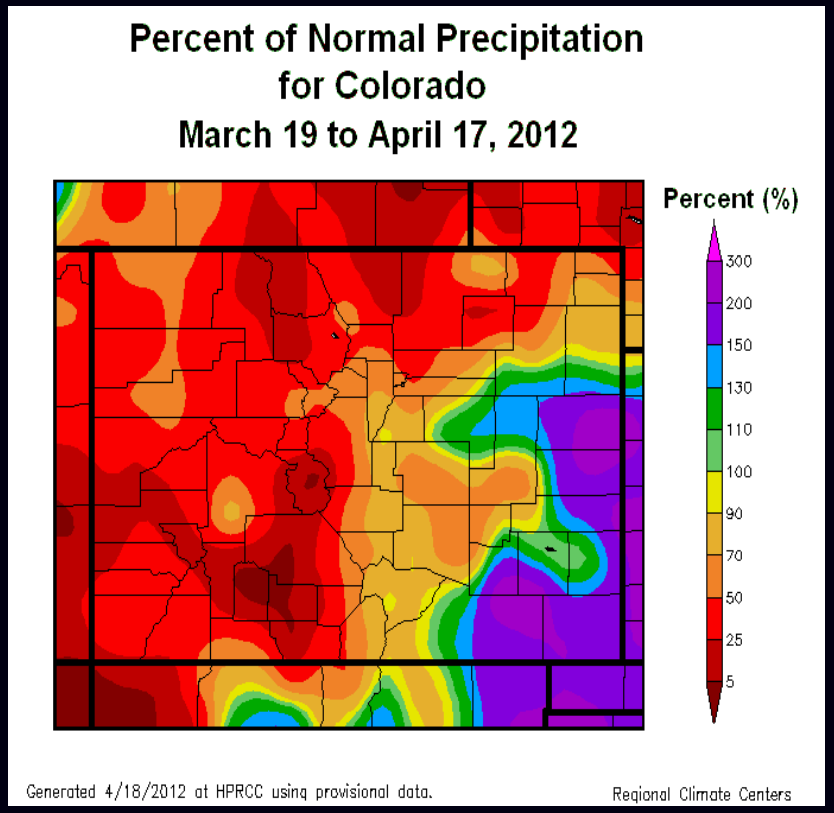
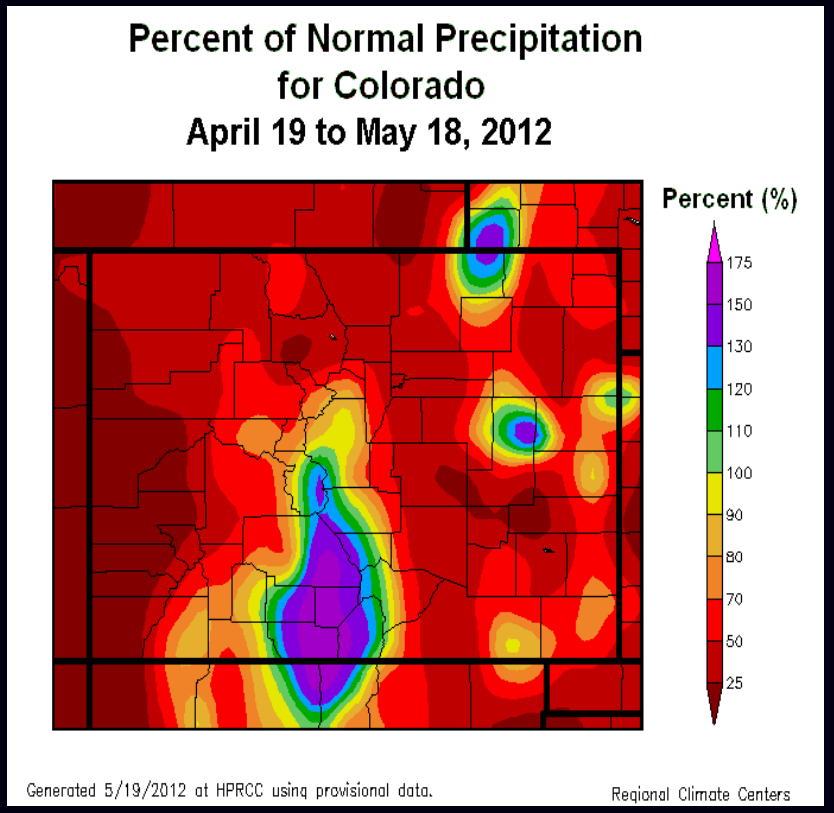




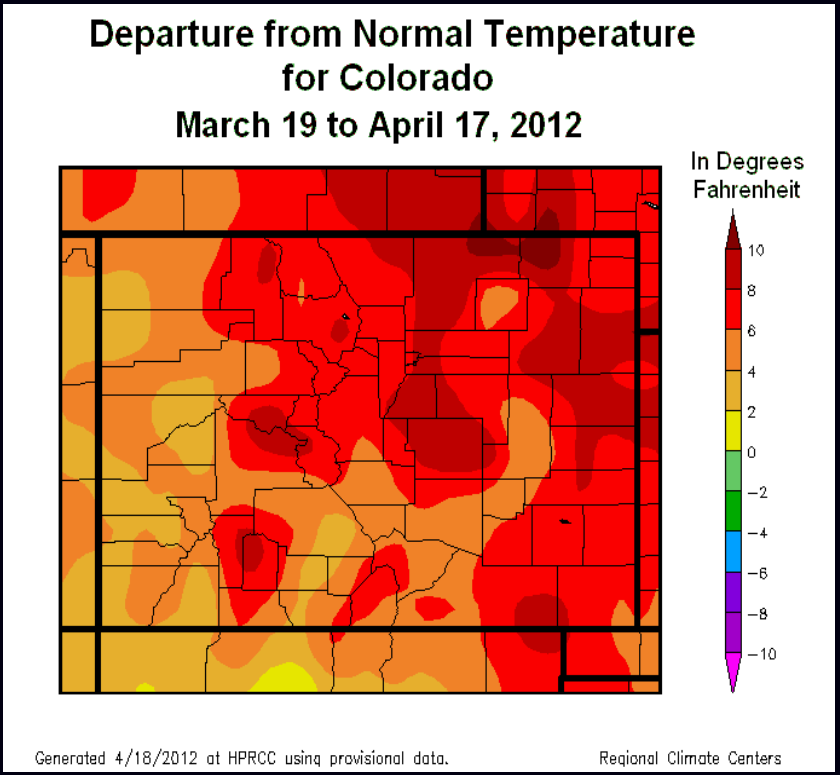
Precipitation for much of Colorado during the 30-day period ending May 18, 2012 (right map) continued to exhibit a downward trend, beginning back in March of this year. Precipitation surpluses in many areas turned to deficits during this 60-day period, with the greatest change occurring in eastern Colorado.

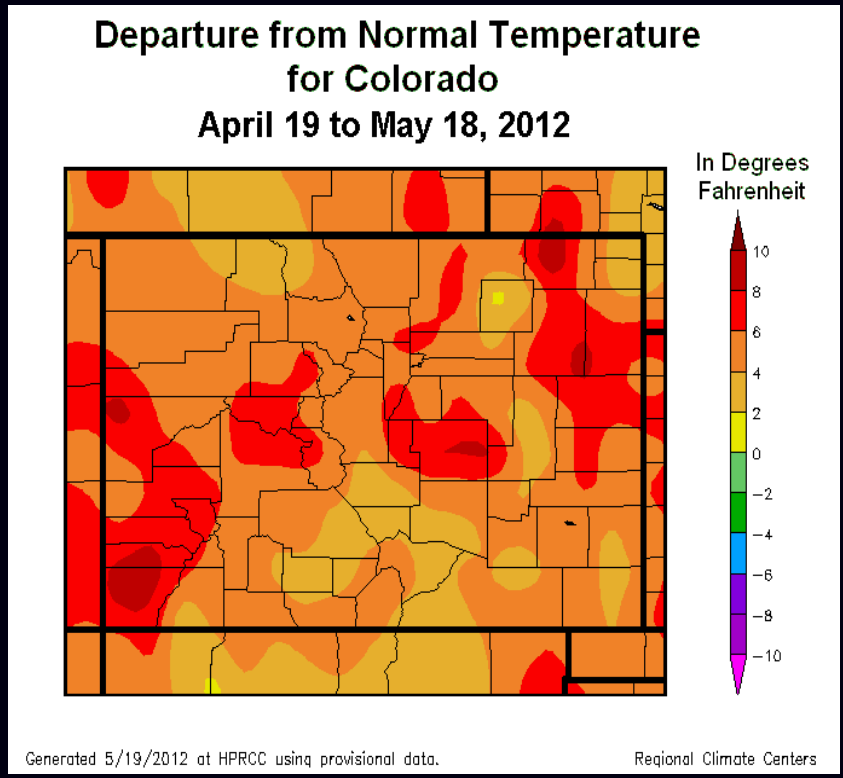




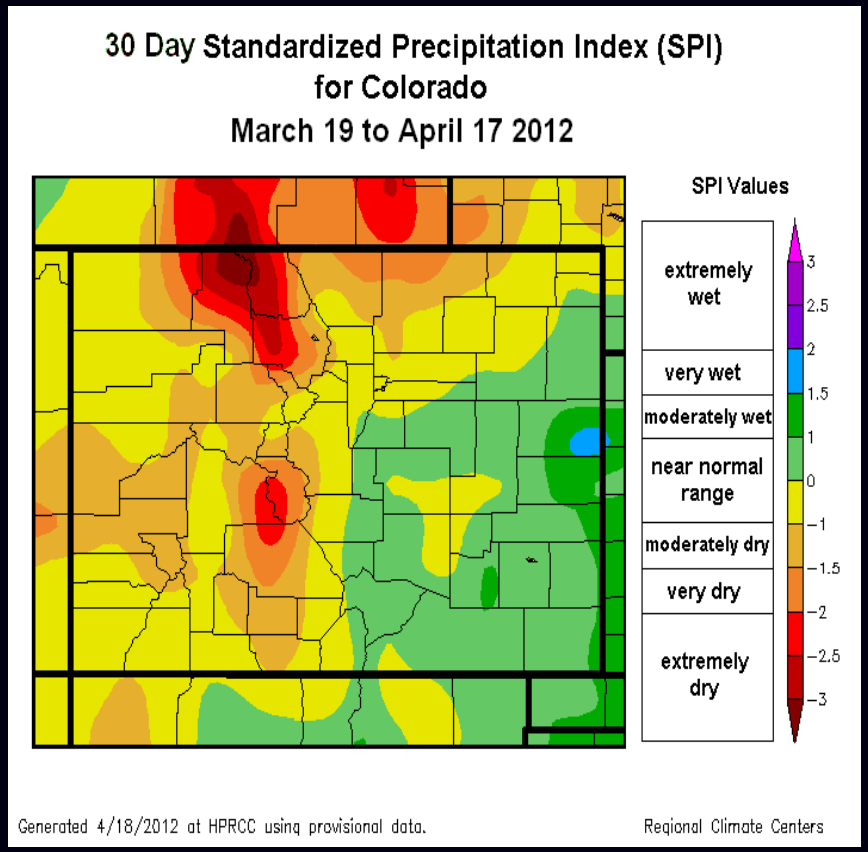
The drying trend during the past 60 days was most pronounced in southeast Colorado where precipitation totals went from around 300 percent of normal during the period March 19 to April 17 (left map) to a mere 25 percent of normal during the period April 19 to May 17 of this year (right map). Dramatic reductions in precipitation were also observed in western Colorado along the Utah border, in the upper Colorado River Basin centered in Grand County, and along the lee slope of the Front Range Mountains in eastern Colorado.

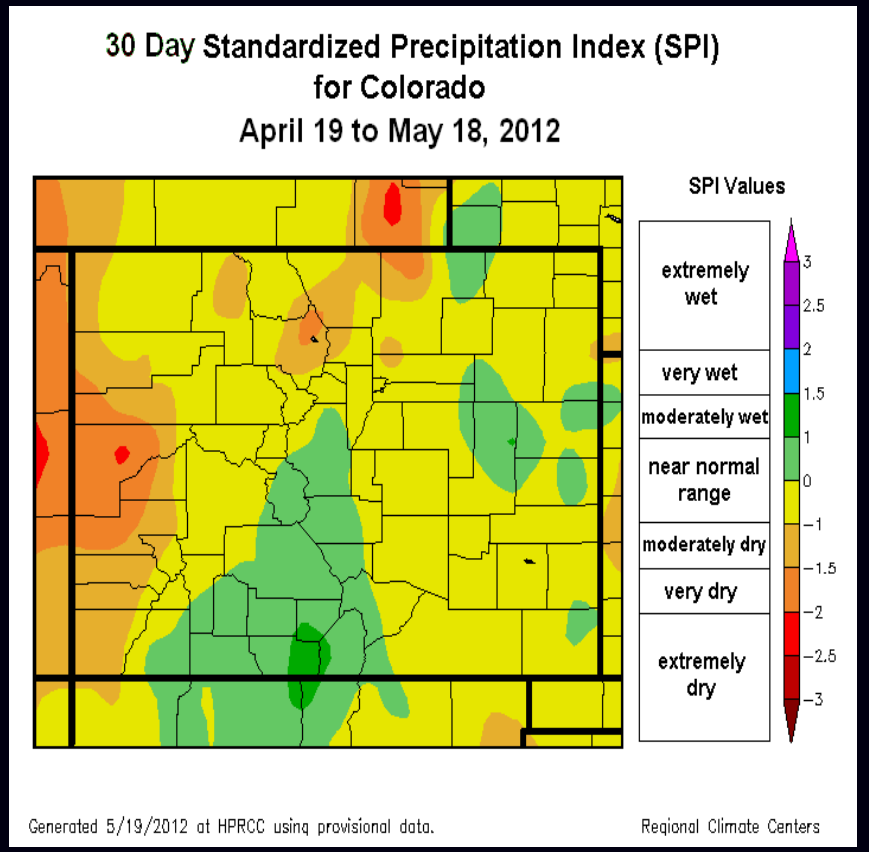
In contrast, the upper Rio Grande Basin and surrounding areas in south central Colorado witnessed above average precipitation during the 30-day period ending May 18th, with amounts ranging from 110 to 175 percent of average.





Temperature extremes moderated across central and eastern Colorado during the 30-day period ending May 18th (right map), after an abnormally warm March and early April. Departures, on average, ranged from 6 to 11 degrees (F) above normal. Whereas western Colorado saw a reversal in this temperature trend with departures as much as 8 degree (F) above average, up from the zero to 4 degree (F) positive anomalies observed during the 30-day period ending April 17th (left map).





The Standardized Precipitation Index (SPI) for the 30-day period ending May 18th indicated near normal to moderately dry soil conditions for much of Colorado, with pockets of very dry conditions along the Utah and Wyoming borders. The SPI also indicated near normal to moderately wet soil conditions in portions of central, south central and eastern Colorado.

The northwest portion of Colorado saw the greatest improvement in soil moisture during this 60-day period.

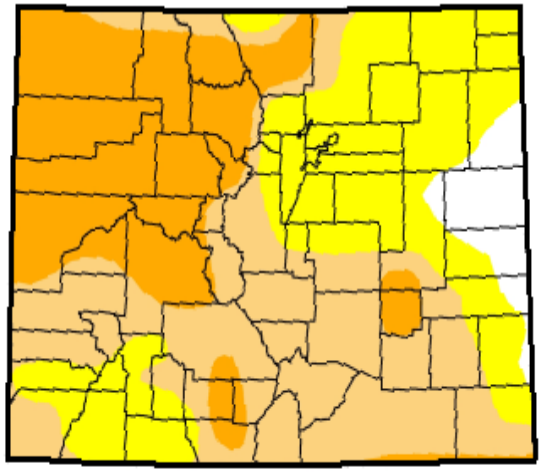
U.S. Drought Monitor

May 15, 2012
Valid 7 a.m. EST

Colorado

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	5.15	94.85	64.57	28.49	0.00	0.00
Last Week (05/08/2012 map)	5.13	94.87	61.81	29.40	0.00	0.00
3 Months Ago (02/14/2012 map)	30.48	69.52	41.07	10.67	0.21	0.00
Start of Calendar Year (12/27/2011 map)	67.79	32.21	24.98	14.94	0.04	0.00
Start of Water Year (09/27/2011 map)	60.62	39.38	27.69	19.99	7.88	0.56
One Year Ago (05/10/2011 map)	39.59	60.41	52.58	40.72	3.25	0.00



Intensity:

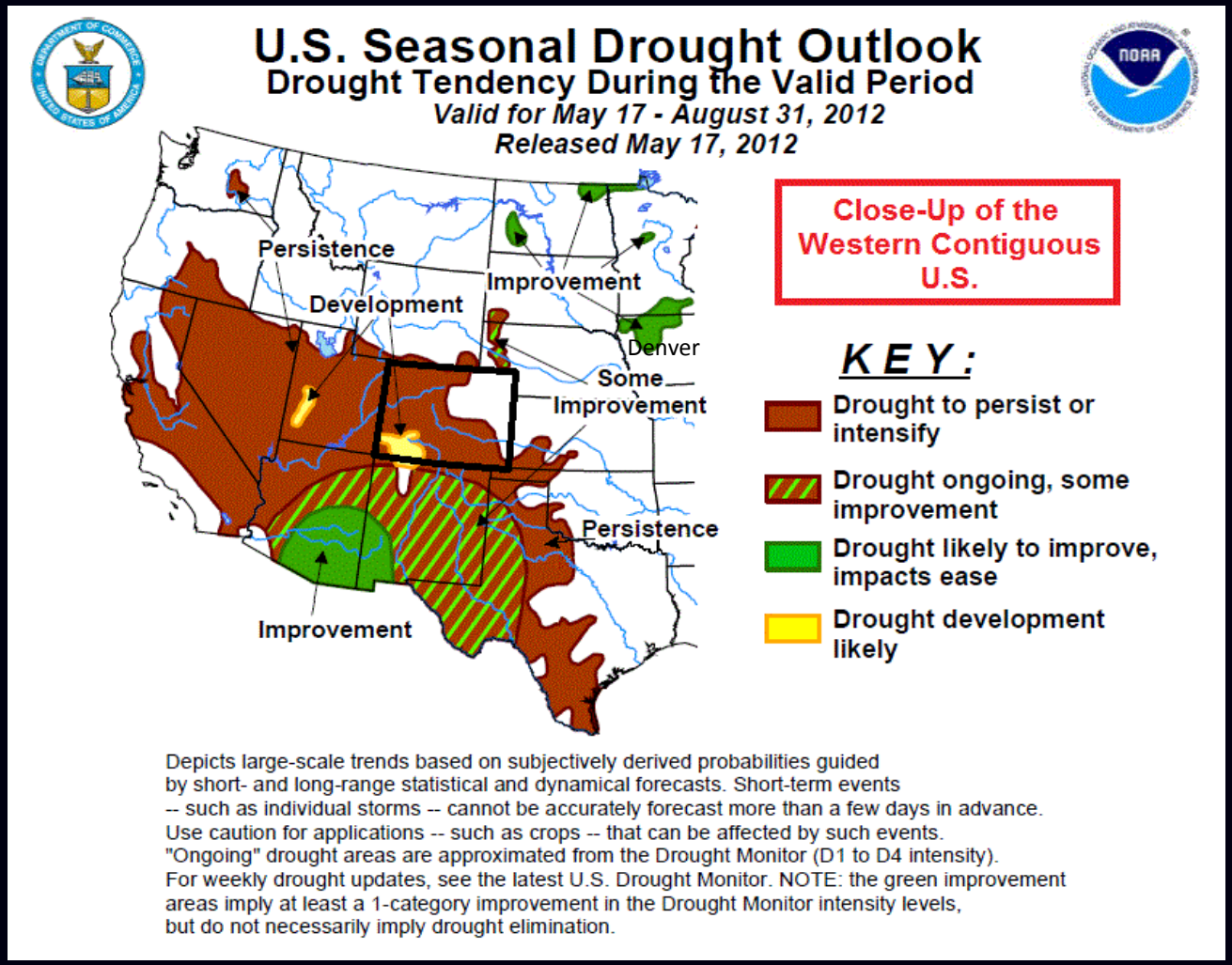
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://droughtmonitor.unl.edu

Released Thursday, May 17, 2012
Brad Rippey, U.S. Department of Agriculture

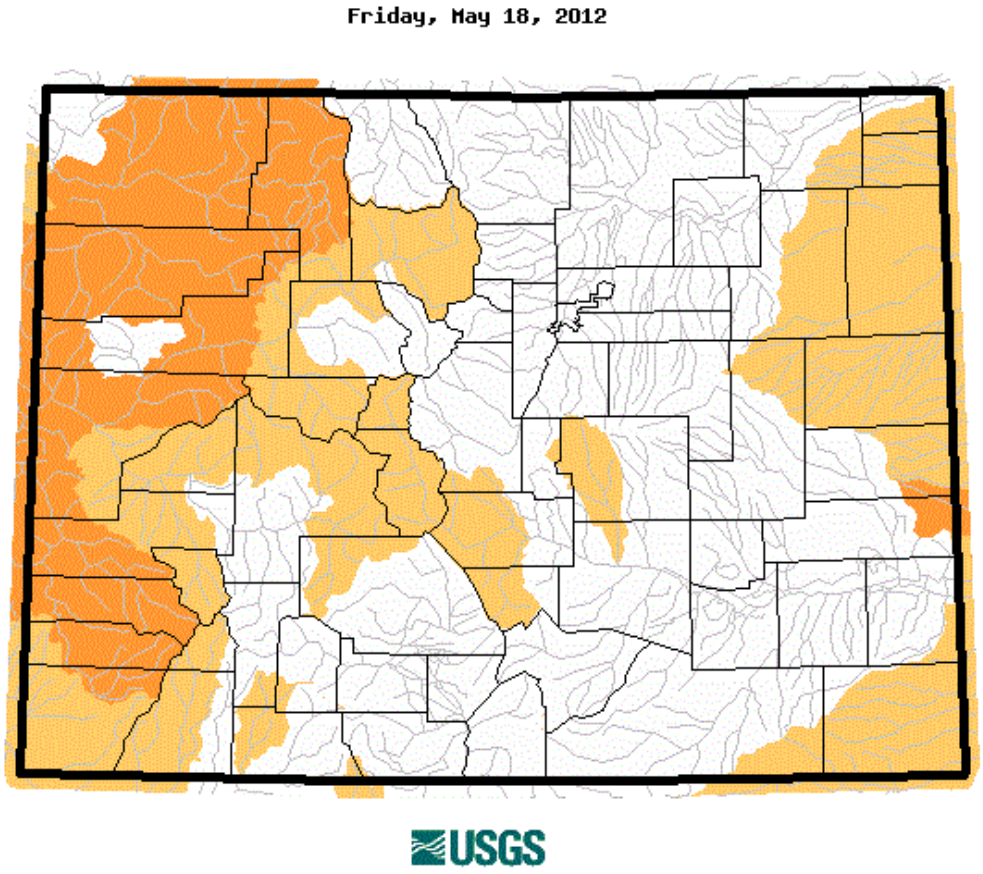
According to the U.S. Drought Monitor, as of May 15, 2012, drought conditions in Colorado ranged from severe (D2) across northwest and west central portions of the state, with pockets of severe drought (D2) in south central and southeast Colorado, to abnormally dry conditions (D0) in southwest and northeast Colorado. Moderate drought conditions (D1) were indicated for the remainder of the state.



The seasonal drought outlook for Colorado (outlined in black) during the period May 17 to August 31, 2012 calls for drought to either persist or intensify across most of Colorado. Exceptions include the northeast plains of the state where drought is not anticipated, and extreme southwest Colorado along the south face of the San Juan Mountains where drought is likely to develop.

For the entire U.S. Outlook, go to www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.gif .

The map below depicts the normal 7-day average streamflow in Colorado compared to historical streamflow for May 18, 2012.



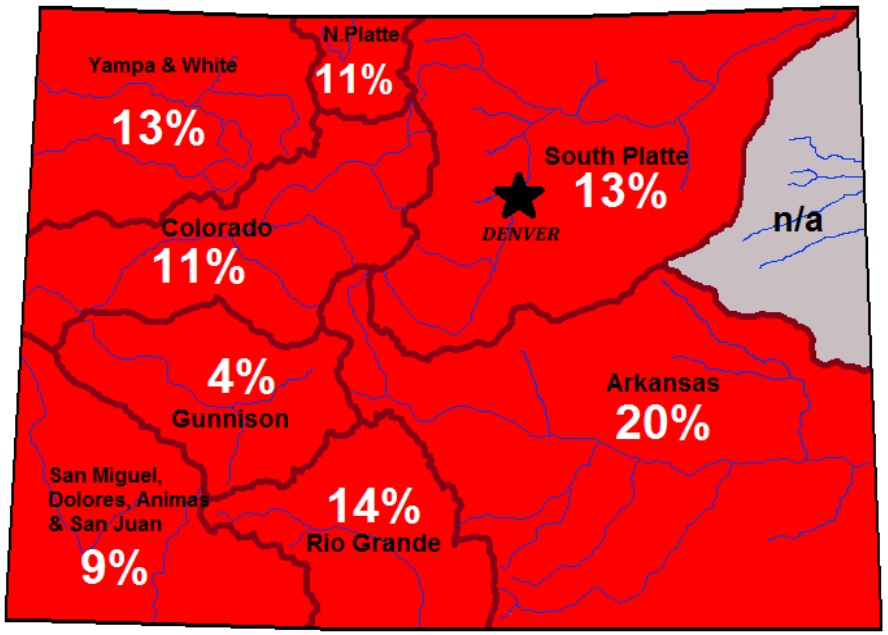
Source: U.S. Department of the Interior, U.S. Geological Survey: http://waterwatch.usgs.gov

According to streamflow data from the USGS, moderate hydrological drought conditions (orange shading) were present across much of western Colorado during the 7-day period ending Friday, May 18, 2012.

The colors on this map represent 7-day average streamflow precentiles based on historical streamflow for the day of the year indicated.

Only streamflow recording stations having at least a 30 year record are used.

The data used to produce this map are provisional and have not been reviewed or edited. They may be subject to significant change.



Snow Water Equivalent as a Percent of Average (%) for Colorado by River Basin as of May 18, 2012.

Basin Wide Percent of Average (%)

West Slope		East Slope	
Yampa & White River Basins	13%	Laramie & North Platte Basin	11%
Upper Colorado River Basin	11%	South Platte River Basin	13%
Gunnison River Basin	4%	Arkansas River Basin	20%
San Miguel, Dolores Animas & San Juan River Basins	9%		
Upper Rio Grande Basin	14%		

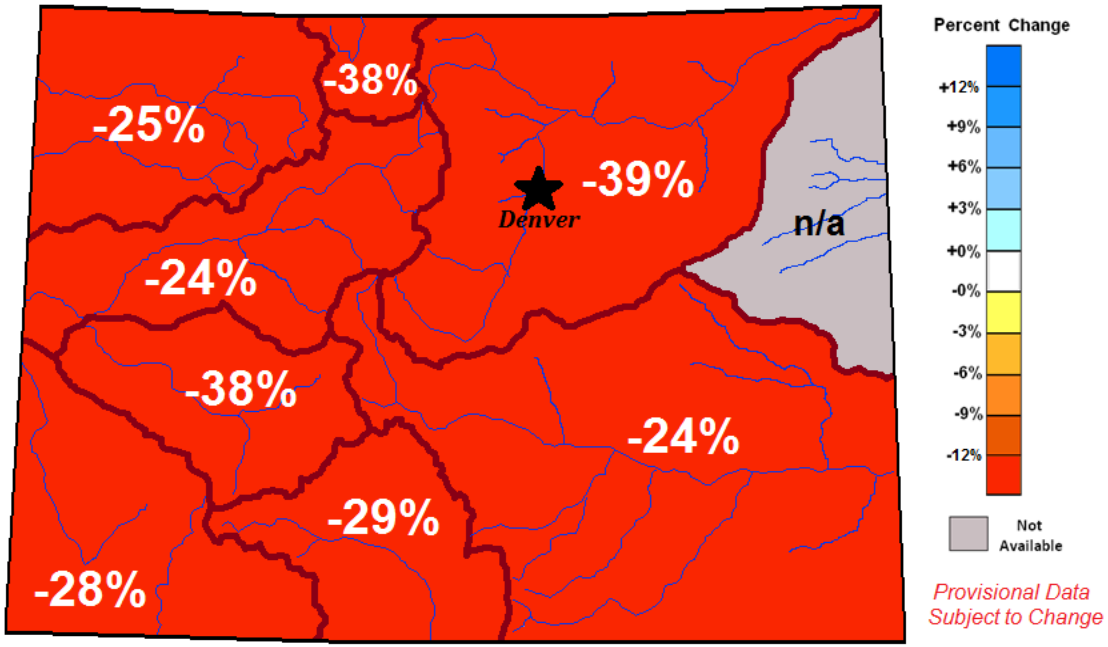
Statewide Avg... 9%

Source: USDA Natural Resources Conversation Service-Water and Climate, Portland, Oregon

As of May 18, 2012, the average snowpack (snow water equivalent) for the entire state of Colorado was a mere **9 percent** of average.

The state's lowest average basin-wide snowpack was observed in the Gunnison River Basin (4 percent) and the San Miguel, Dolores, Animas and San Juan River Basin in southwest Colorado (9 percent). Snow water equivalents in the state's remaining basins were not much better, and only slightly better than the statewide average.

Colorado SNOTEL Snow Water Equivalent Change Map



Provisional Data Subject to Change

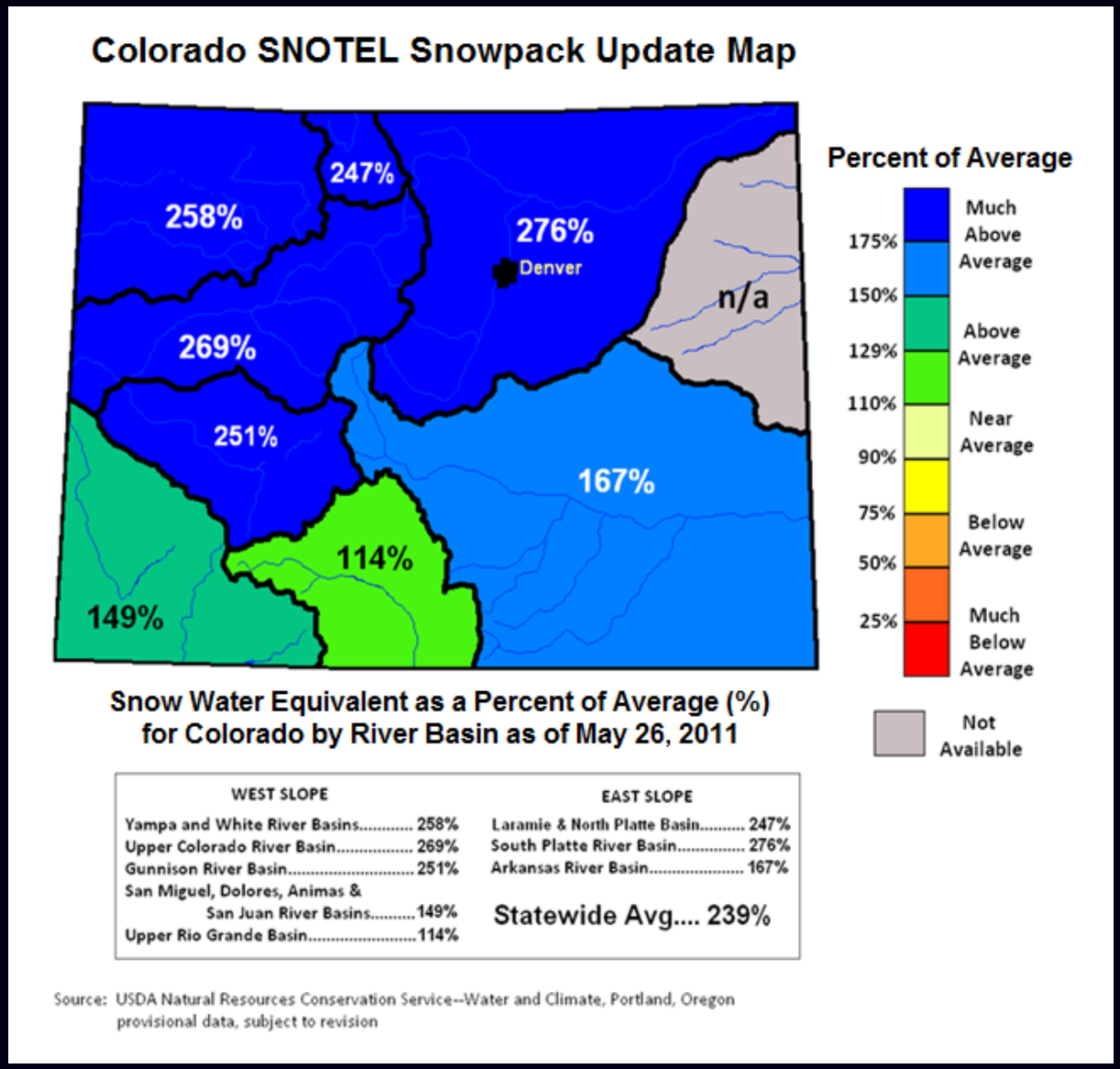
Percent of Change of Snow Water Equivalent Per River Basin in Colorado from April 18 to May 18, 2012

West Slope		East Slope	
Yampa & White River Basins	-25%	Laramie & North Platte Basin	-38%
Upper Colorado River Basin	-24%	South Platte River Basin	-39%
Gunnison River Basin	-38%	Arkansas River Basin	-24%
San Miguel, Dolores Animas & San Juan River Basins	-28%	Statewide Avg...	-30%
Upper Rio Grande Basin	-29%		

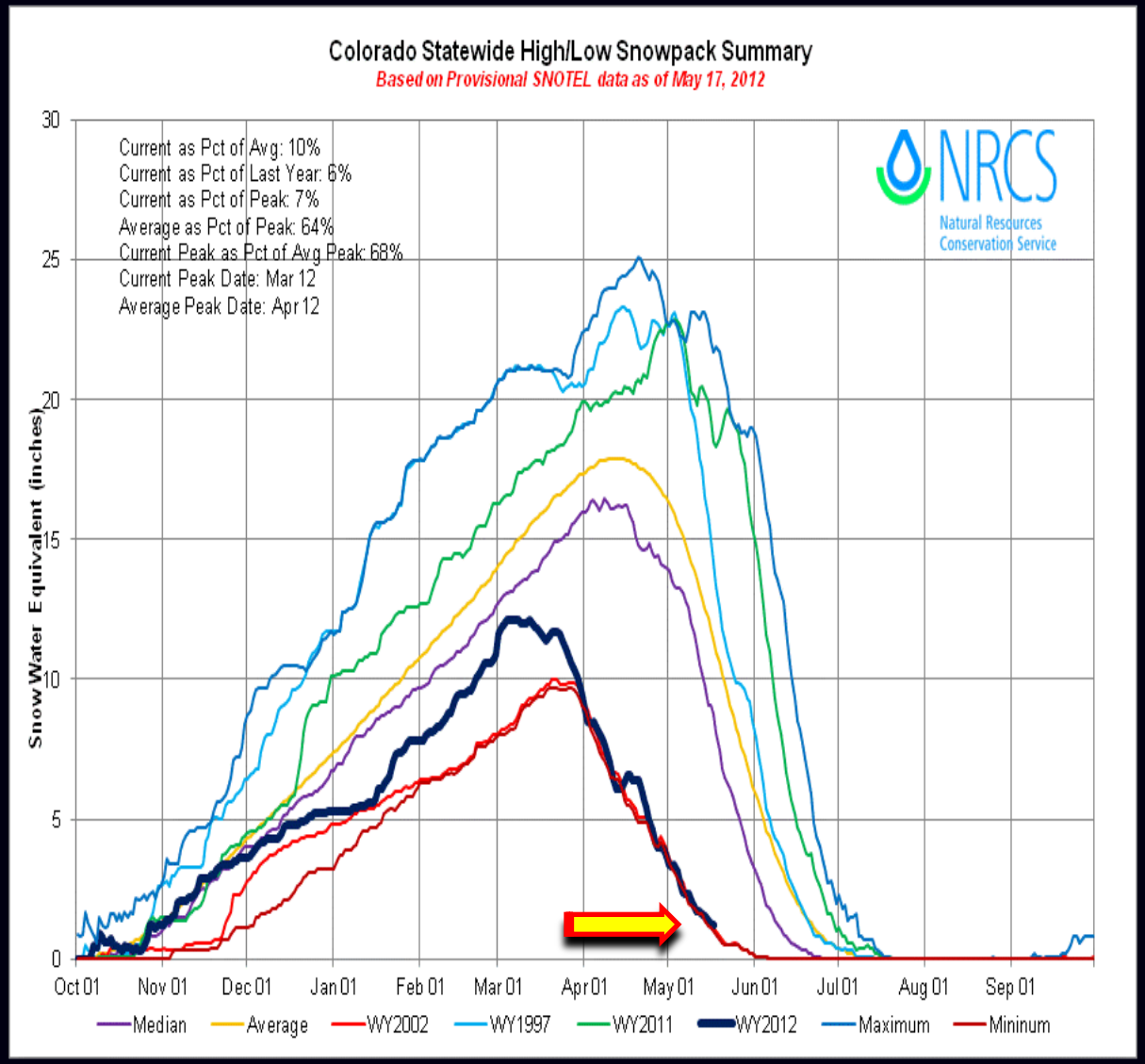
Source: USDA Natural Resources Conversation Service-Water and Climate, Portland, Oregon

From April 18 to May 18 of this year, snow water equivalent for the state of Colorado decreased significantly by an average of ***30 percent***.

The South Platte River Basin saw the greatest basin-wide decrease of 39 percent, with the Gunnison River Basin close behind at 38 percent.

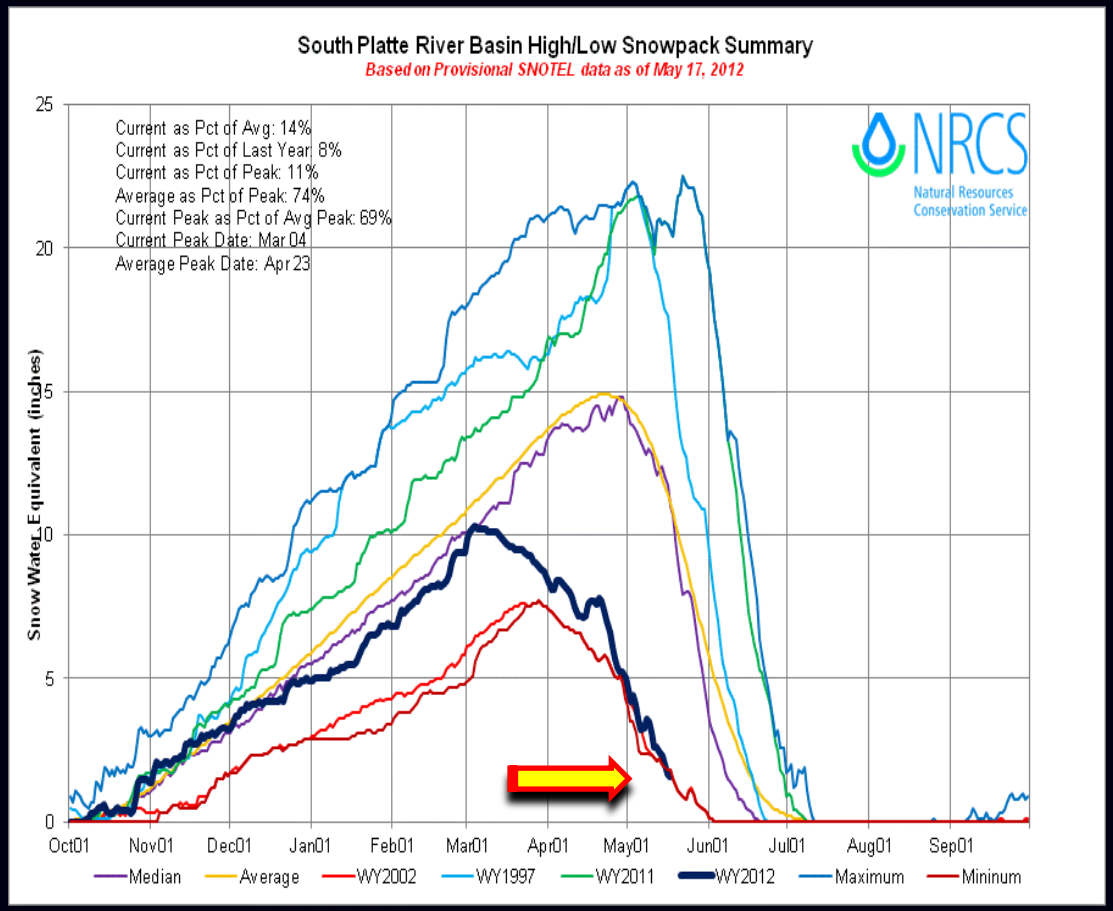


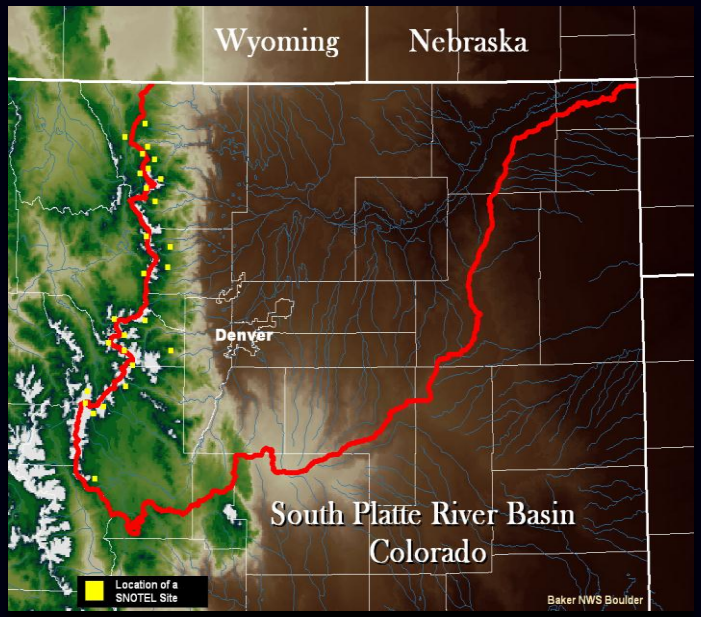
The statewide average snow pack (snow water equivalent) as of May 17th, 2012 was an impressive ***230 percent*** below the near record snowpack observed at about the same time as last year!



The average state-wide snowpack (snow water equivalent) as of May 17, 2012 (indicated by the thick dark blue line) continued to lag far behind the snowpack observed in mid-May of the near record snowpack winter seasons of 1996-1997 (light blue line) and 2010-2011 (green line).

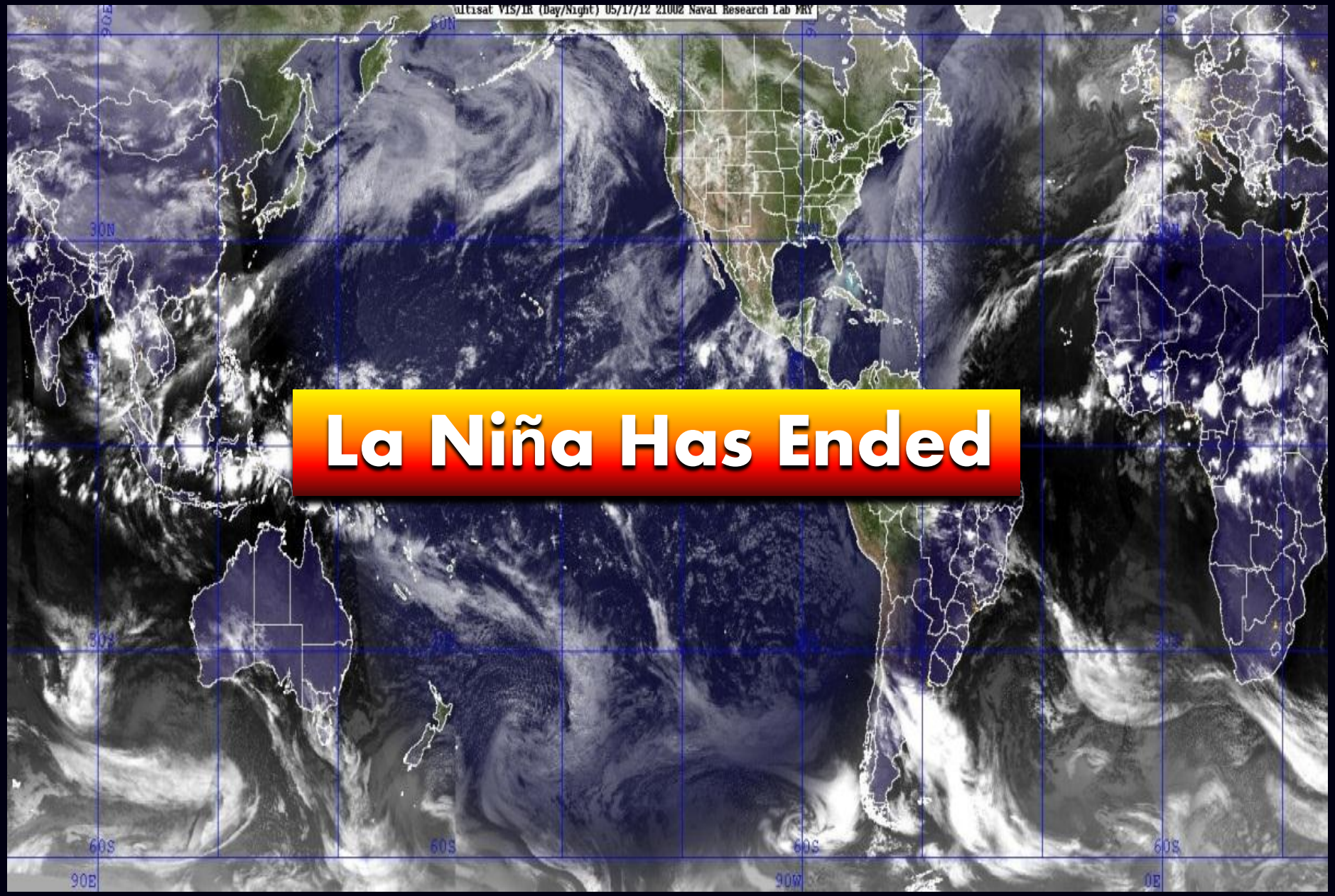
Average state-wide snowpack as of mid-May of this year (pointed out by the arrow) was very similar to that observed at this same time during the near record minimum snowpack of the 2001-2002 winter season (lighter red line.)



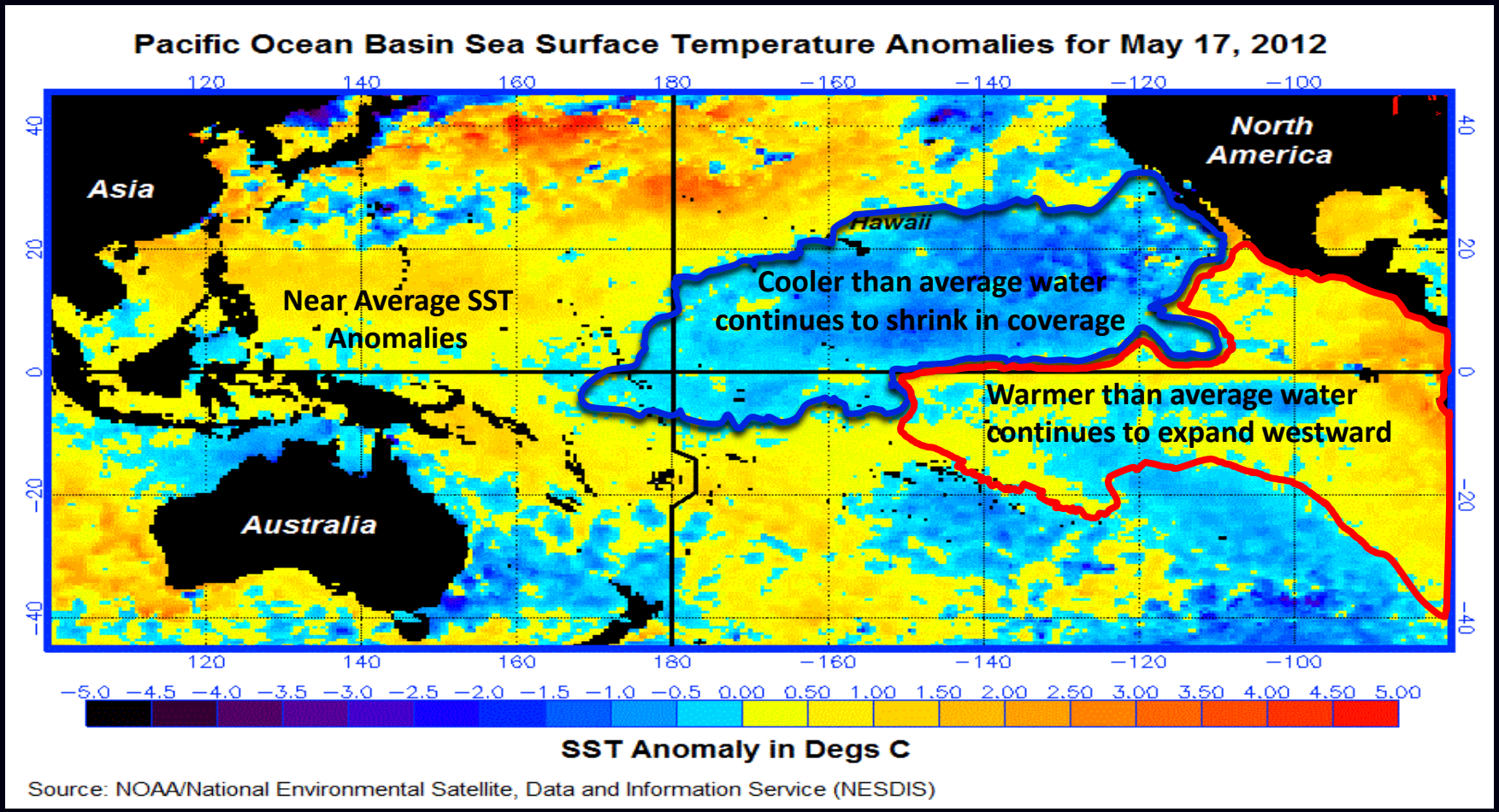


Yellow dots – reporting SNOTEL sites

The average snow water equivalent for the South Platte River Basin in northeast Colorado (see map in upper right) for the 2011-2012 winter season (the thick dark blue line in upper left) was nearly as dismal as that observed during the near record minimum snowpack of 2001-2002 (lighter red line). Although basin-wide snow water equivalents earlier this winter season were not as low as those at the same time in 2002.

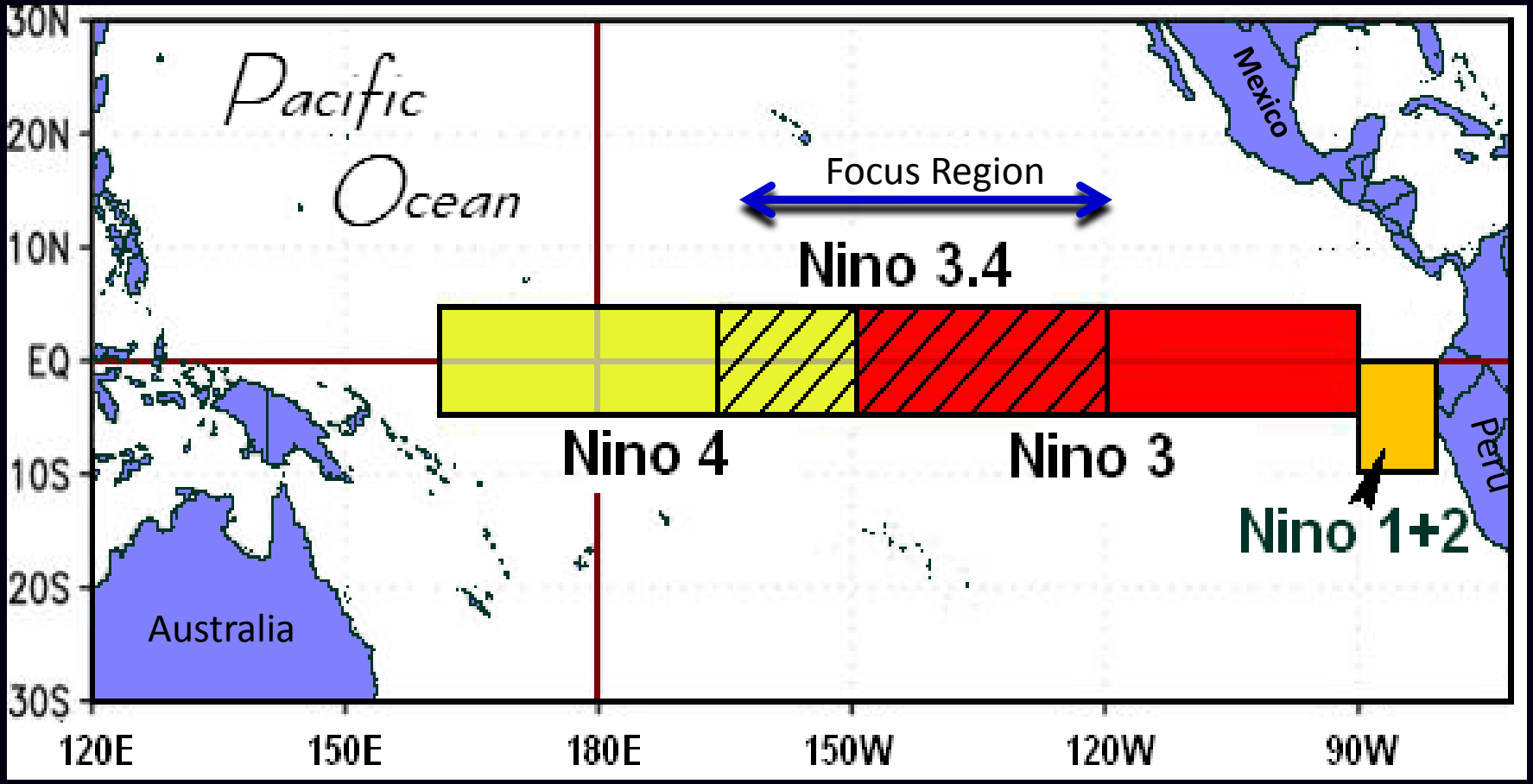


Source: U.S. Naval Research Lab MRY

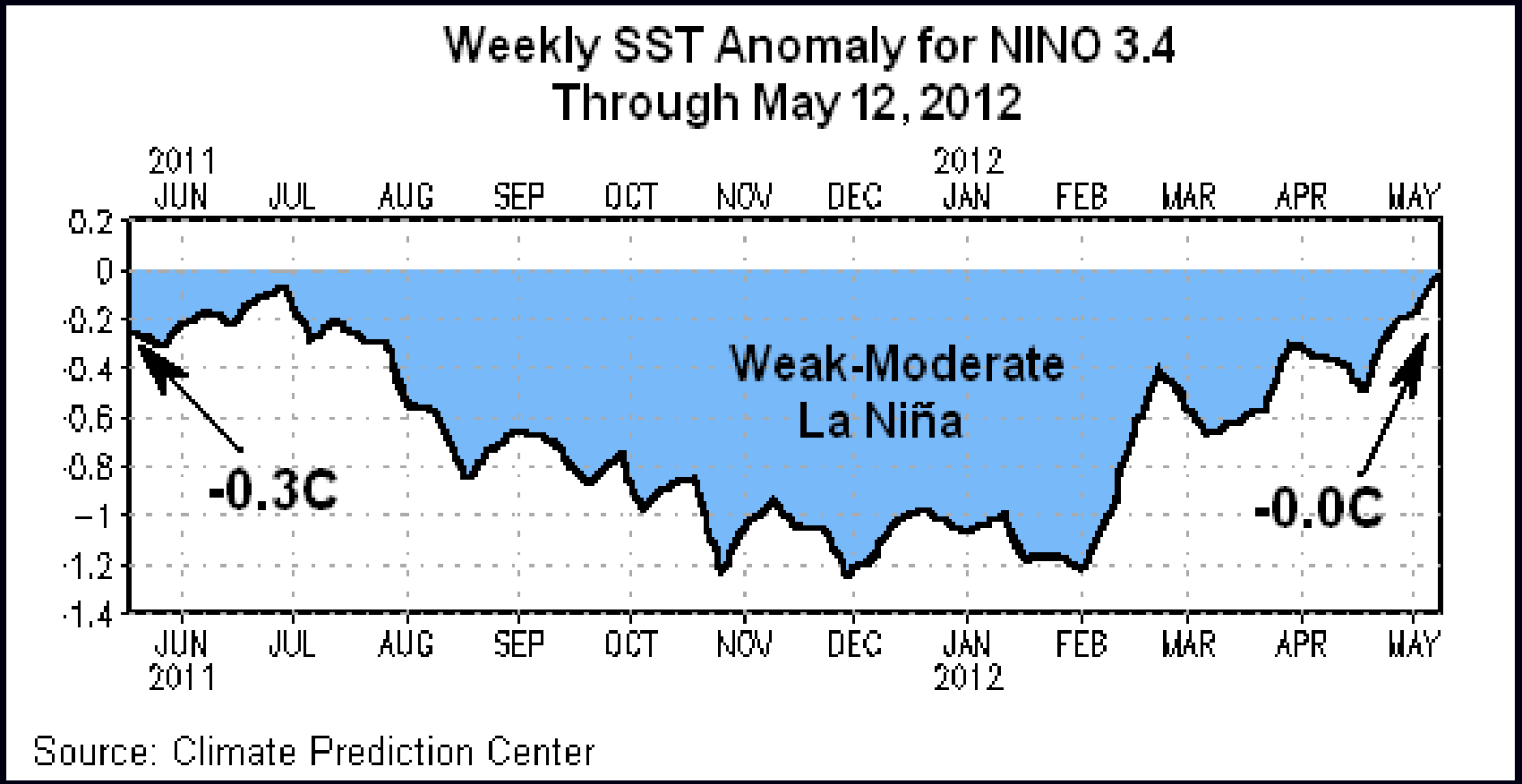


La Niña was no longer as of the end of April. Below average sea surface temperatures (SST) once present in the central and eastern tropical Pacific Ocean have warmed to near average or slightly above average in the past few weeks. The negative SST anomalies off the west coast of North America and down across the central subtropical Pacific Ocean have also continued to warm. Furthermore, SST anomalies in the western equatorial Pacific around Indonesia and northern Australia have moderated to near average. This is an indication that neutral ENSO (El Niño-Southern Oscillation) conditions have returned to the Pacific Basin.

Niño Regions in the Equatorial Pacific Ocean



Niño 3.4 – The principal region in the eastern Equatorial Pacific Ocean used by the Climate Prediction Center (CPC) for monitoring, assessing and predicting ENSO (hatched region on the above map) .



As of May 12, 2012 the weekly SST anomaly for Niño 3.4 region was -0.0C. One year ago, the SST anomaly was -0.3C. Weekly SST anomalies in Niño 3.4 have steadily increased in a positive direction during the past four weeks. A SST anomaly of -0.45˚C or lower is an indicator of La Niña, and above -0.45˚C and below +0.45˚C neutral ENSO conditions.

The Latest Oceanic Niño Index - ONI

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2000	-1.7	-1.5	-1.1	-0.9	-0.8	-0.7	-0.6	-0.5	-0.5	-0.6	-0.8	-0.8
2001	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.3
2002	-0.2	0.0	0.1	0.3	0.5	0.7	0.8	0.8	0.9	1.2	1.3	1.3
2003	1.1	0.8	0.4	0.0	-0.2	-0.1	0.2	0.4	0.4	0.4	0.4	0.3
2004	0.3	0.2	0.1	0.1	0.1	0.3	0.5	0.7	0.7	0.7	0.7	0.7
2005	0.6	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.0	-0.2	-0.5	-0.8
2006	-0.9	-0.7	-0.5	-0.3	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.0
2007	0.7	0.3	-0.1	-0.2	-0.3	-0.3	-0.3	-0.6	-0.9	-1.1	-1.2	-1.4
2008	-1.5	-1.5	-1.2	-0.9	-0.7	-0.5	-0.3	-0.2	-0.1	-0.2	-0.4	-0.7
2009	-0.9	-0.8	-0.6	-0.2	0.1	0.4	0.5	0.6	0.7	1.0	1.4	1.6
2010	1.6	1.4	1.1	0.7	0.2	-0.3	-0.8	-1.2	-1.4	-1.5	-1.5	-1.5
2011	-1.4	-1.3	-1.0	-0.7	-0.4	-0.2	-0.2	-0.3	-0.6	-0.8	-1.0	-1.0
2012	-0.9	-0.7	-0.5									

NOAA/CPC Last Update 05-04-12

The ONI -0.5 indicates the presence of a weak La Niña during the 3-month climate season FEB-MAR-APR, 2012.

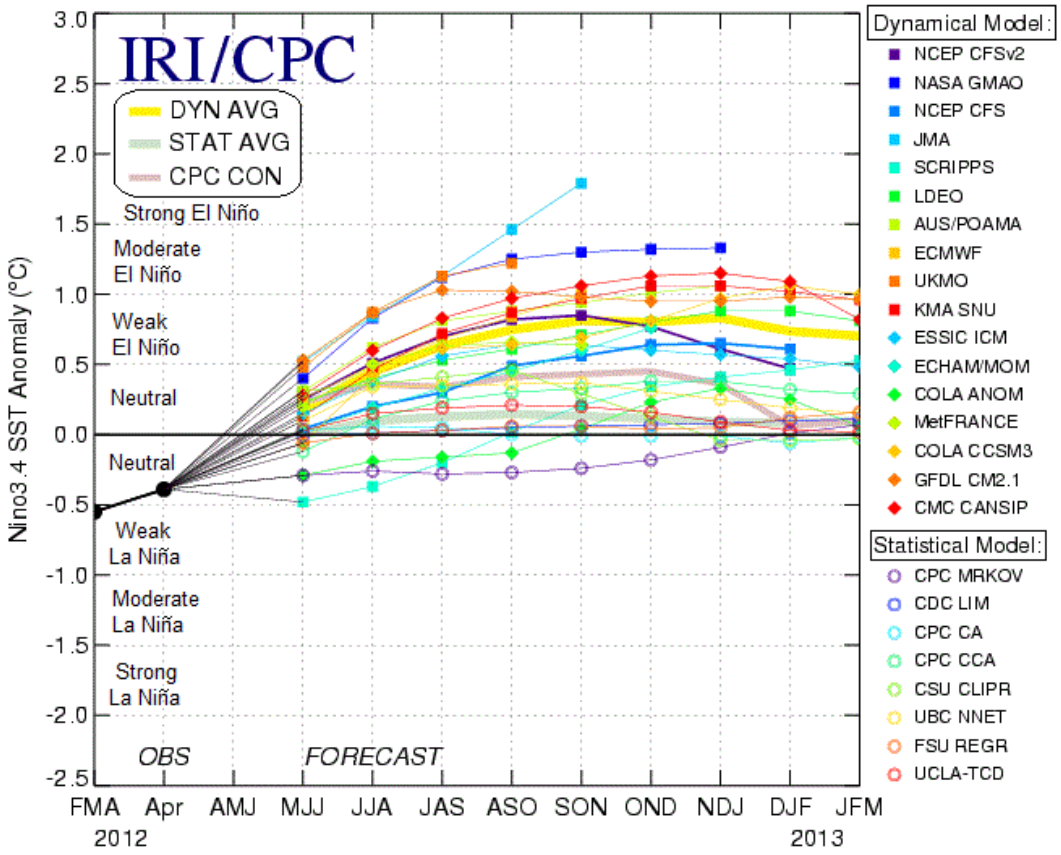
El Niño : ONI higher than +0.45
Neutral ENSO : ONI lower than +0.45 and higher than -0.45
La Niña: ONI lower than -0.45

The ONI is based on sea surface temperature (SST) departures from average in the Niño 3.4 region of the eastern tropical Pacific Ocean. It is the principal measure used by NOAA's Climate Prediction Center (CPC) for monitoring, assessing and predicting El Niño/Southern Oscillation (ENSO.)

ONI is defined as the three-month running-mean SST departures in the Niño 3.4 region.

ONI is used to place current ENSO and non-ENSO events into a historical perspective.

CPC's operational definitions of El Niño and La Niña are keyed to the ONI index.



Forecast SST Anomalies (deg C) in the Niño 3.4 Region

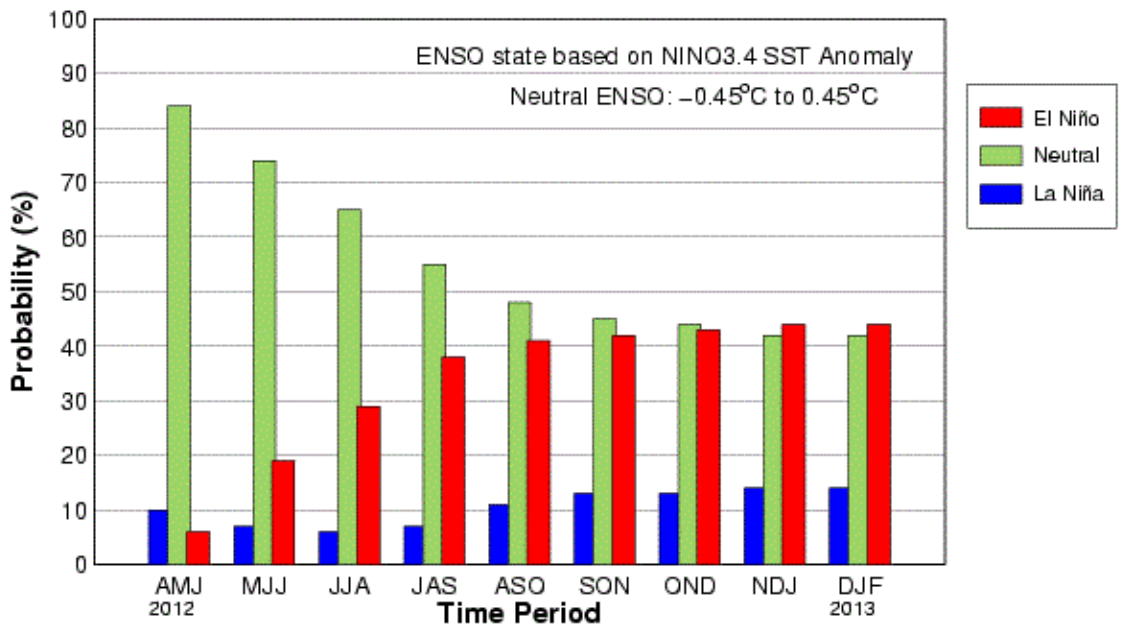
Seasons (2012-2013)	MJJ	JJA	JAS	ASO	SON	OND	NDJ	DJF	JFM
Average, Dynamical Models:	0.2	0.4	0.6	0.7	0.8	0.8	0.8	0.7	
Average, Statistical Models:	-0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average, All Models:	0.1	0.3	0.5	0.6	0.6	0.5	0.5	0.4	0.4

Source: The International Research Institute for Climate and Society (IRI)

The ENSO Outlook

Although a majority of the dynamical and statistical models predict a continuation of neutral ENSO conditions through the middle of the summer (June-August), slightly more than half of the models predict the development of El Niño conditions around the July-September climate season, and a continuation through the remainder of 2012.

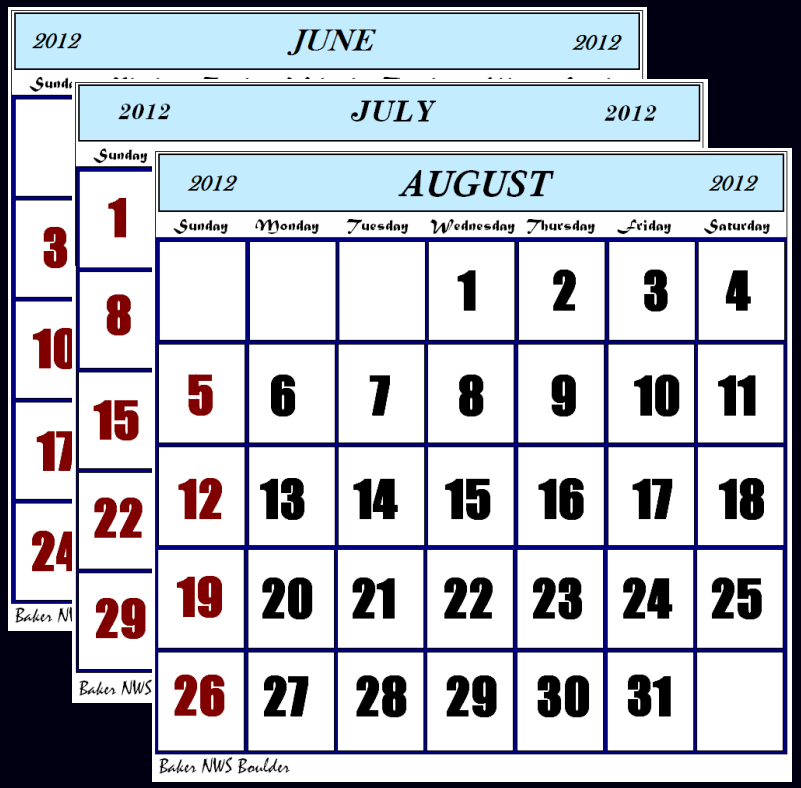
Still, a sizable number (40-45%) of the models (largely dynamical models) predict a continuation of neutral ENSO conditions throughout 2012.



Season	La Niña	Neutral	El Niño
AMJ 2012	10%	84%	6%
MJJ 2012	7%	74%	19%
JJA 2012	6%	65%	29%
JAS 2012	7%	55%	38%
ASO 2012	11%	48%	41%
SON 2012	13%	45%	42%
OND 2012	13%	44%	43%
NDJ 2013	14%	42%	44%
DJF 2013	14%	42%	44%

According to model probabilities, it is clear that uncertainty remains regarding the state of ENSO during the second half of 2012.

Although, it is reasonably certain to conclude that La Niña conditions will not return for this summer and autumn (June-December) seasons.



Looking Forward to the Next Three Months

Historical Trends in Temperature and Precipitation and the Latest Outlook From NOAA's Climate Prediction Center

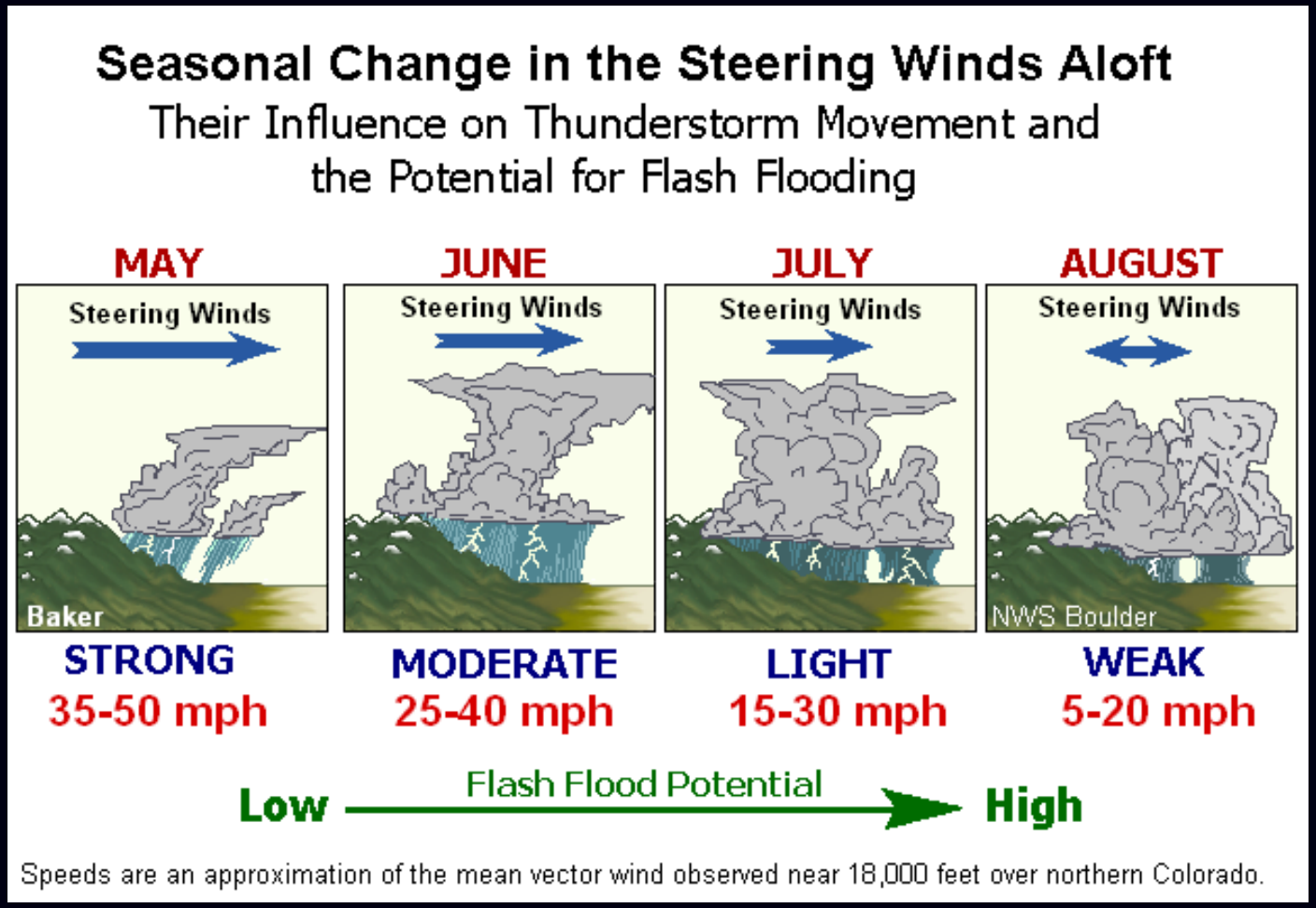
The Final Week of May and the First Two Weeks of June Historically Have Been the Start of the Convective Severe Weather Season in Northeast Colorado

Flash Flooding

Hail

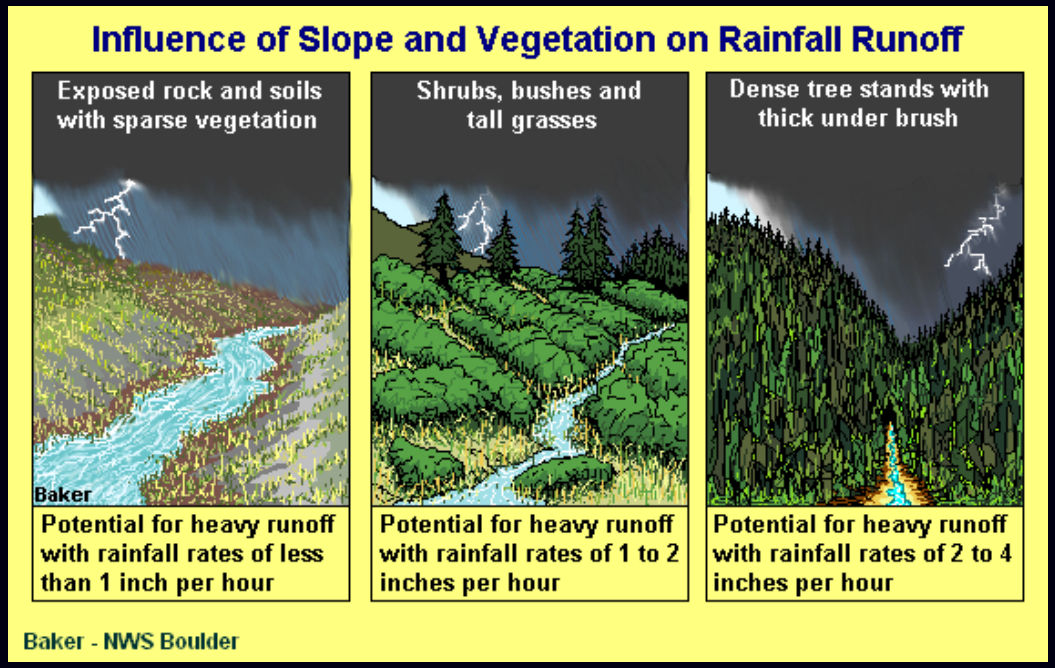
Potentially Damaging Thunderstorm Winds

Tornadoes



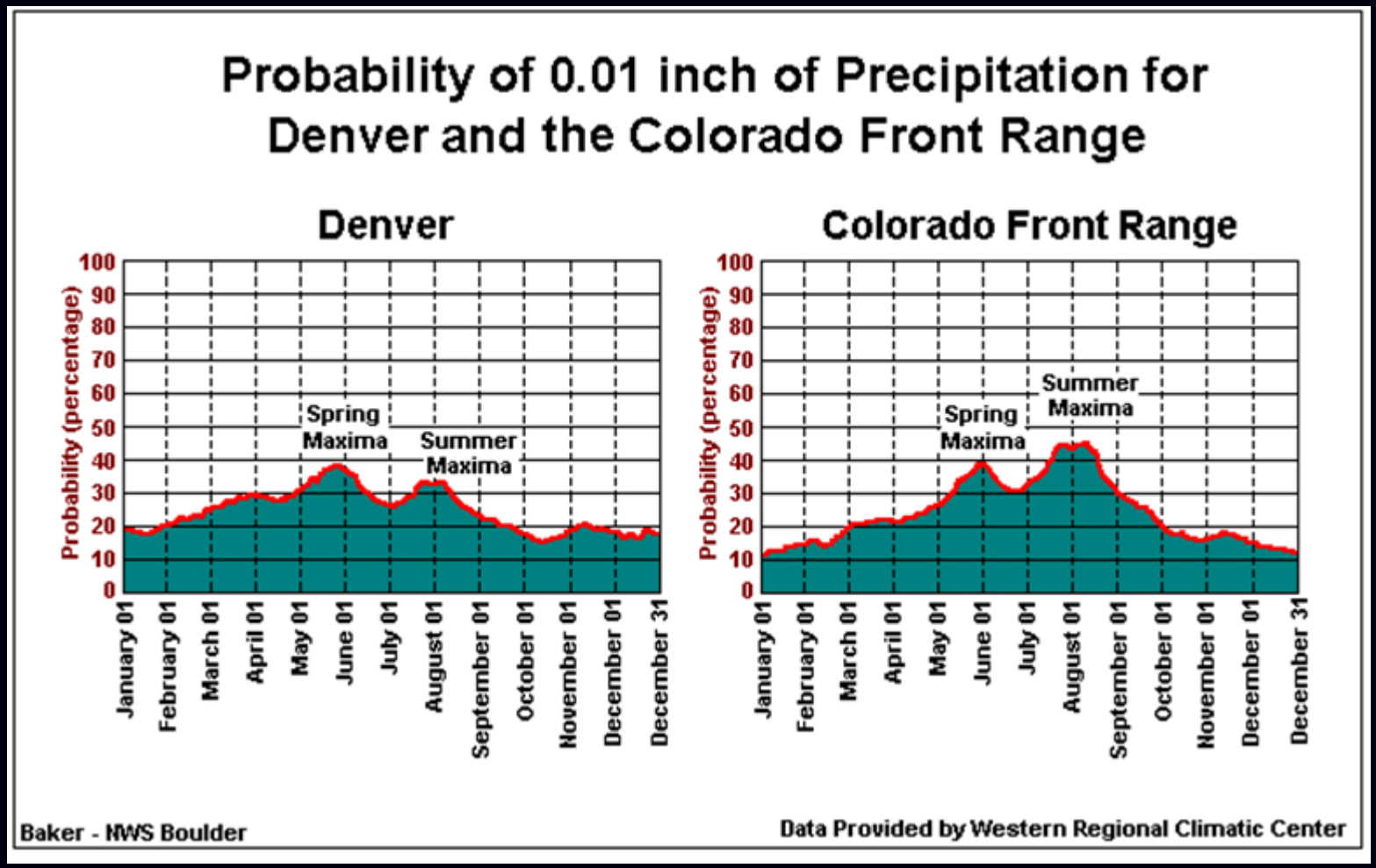
Flash Floods

The risk of flash flooding significantly increases during June and peaks, on average, in late July and early August during the so-called summer “monsoon”. This is a period of the year when steering winds aloft are typically at their weakest and the moisture content of the lower atmosphere along the Colorado Front Range is normally greatest. Flash flooding is more likely to occur with slow moving and stationary thunderstorms.

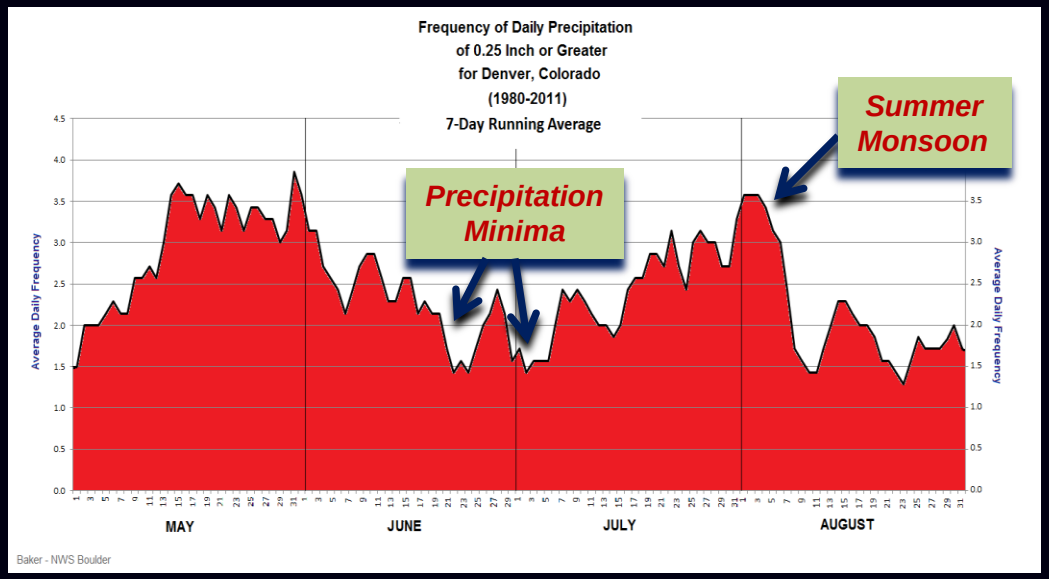


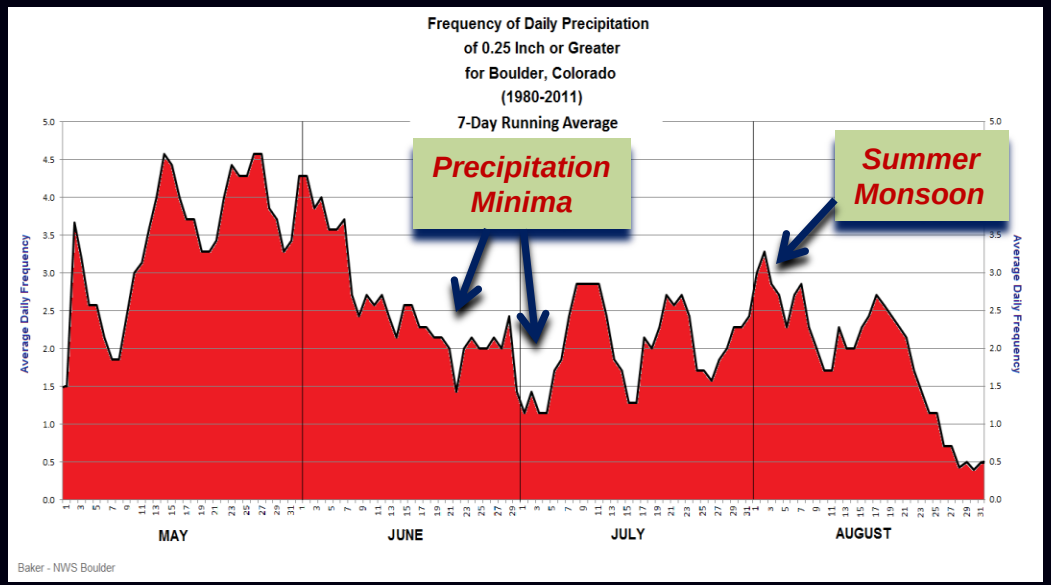
In addition to the speed of movement of a thunderstorm, the amount of rain (and hail) it deposits on a location and the time it takes for this to occur, other factors such as the slope of the terrain, the type and degree of vegetation and soil permeability play a significant role in the production of flash floods.

One should ***never*** rule out the possibility of ***flash flooding***, particularly in steep mountainous terrain and in areas recently burned over by wildfire. Thunderstorms can form suddenly over higher terrain several miles upslope from you without your knowledge. Flood waters can rush downstream from this storm without warning even as you sit under a cloud free sky.



The probability of measurable precipitation (at least 0.01 inch) peaks, on average, twice a year; once in late spring and the other in mid-summer for Denver and several Colorado Front Range foothill communities. The likelihood of measurable precipitation for Denver is slightly greater in late spring, and for the Front Range communities in mid-summer. All locations experience, on average, a reduction in precipitation occurrence in late June and early July.

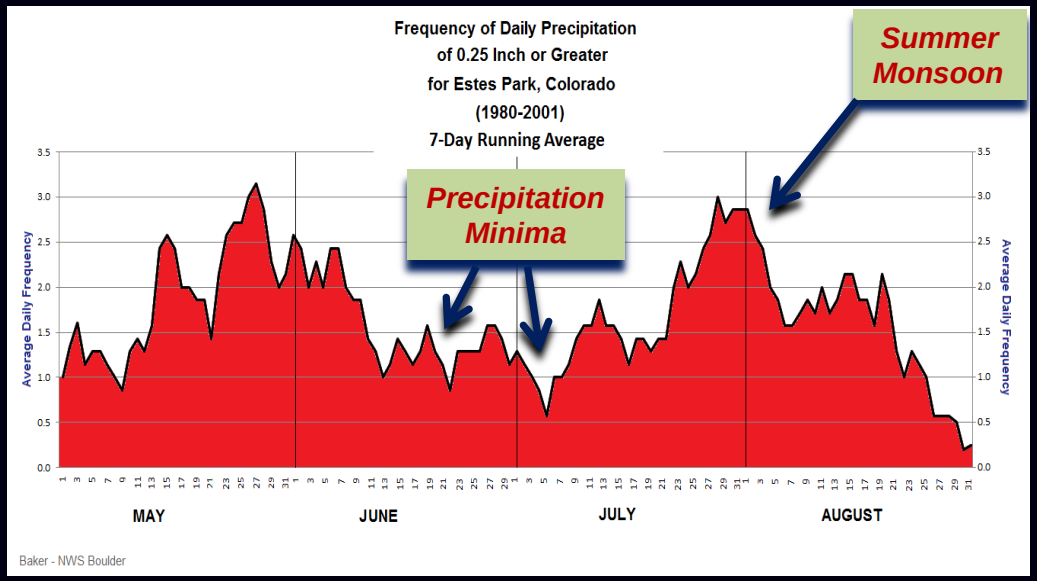


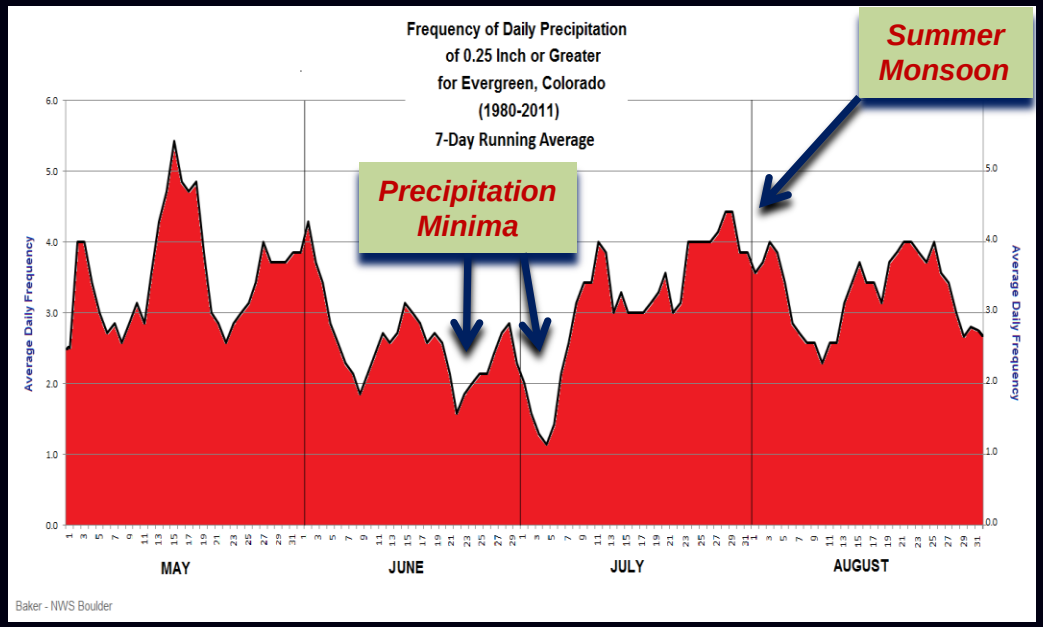


For Denver and Boulder, Colorado…

The probability of daily precipitation of at least 0.25 inch peaks, on average, in late May and early June and again in late July and early August during the period often referred to as the ***summer monsoon***. During this later period of increased thunderstorm activity, the likelihood for intense rainfall and ***flash flooding*** is greater than just about any other time of the year, due in large part to very slow moving thunderstorms.

A precipitation minima is evident on these plots in early summer (late June and early July) at both locations. This period of comparatively dry weather is often accompanied by some of the warmest temperatures of the summer.





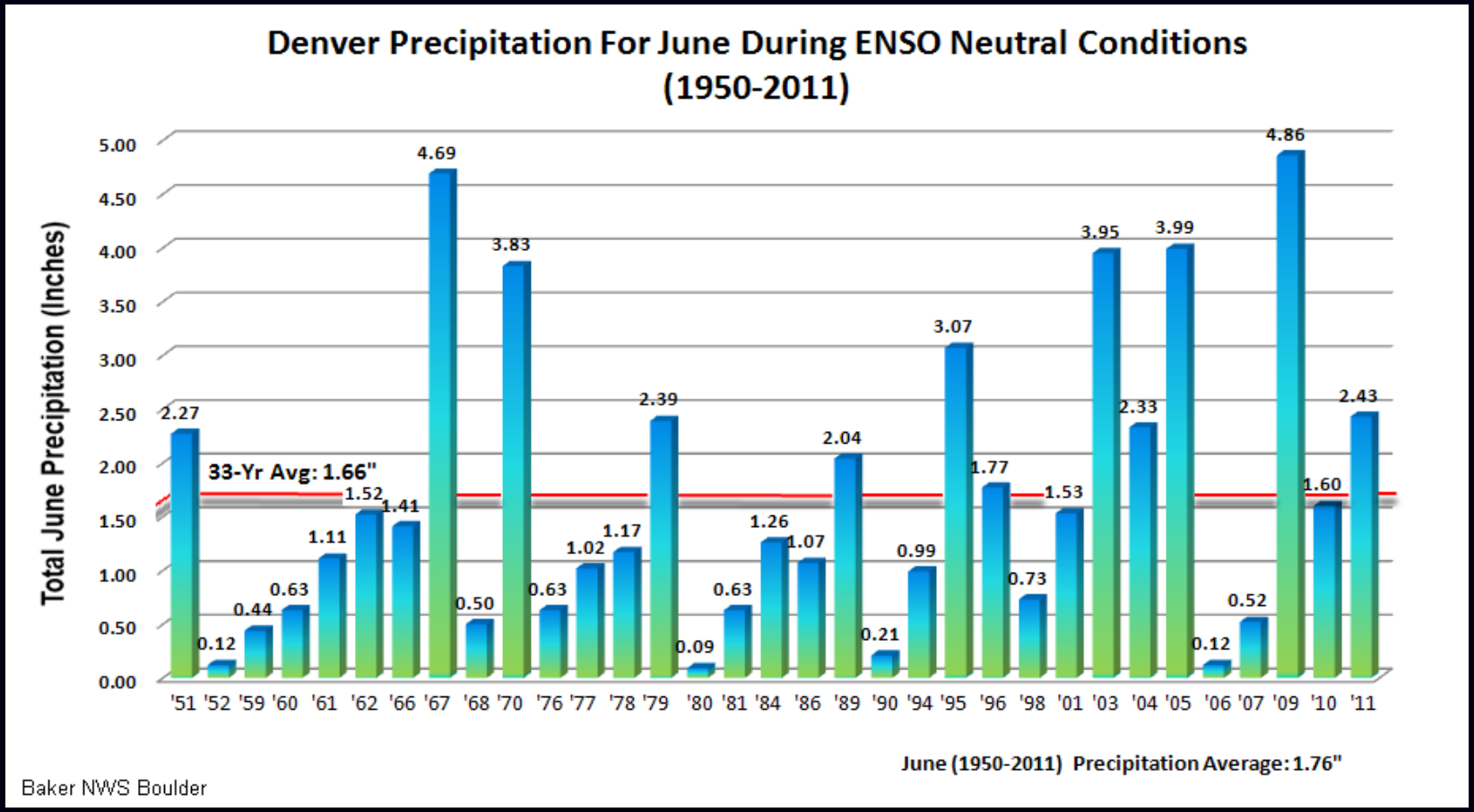
For the Front Range Foothill Communities of Estes Park and Evergreen, Colorado…

The probability of daily precipitation of at least 0.25 inch peaks, on average, in mid to late May, and in late July and early August for both foothill locations.

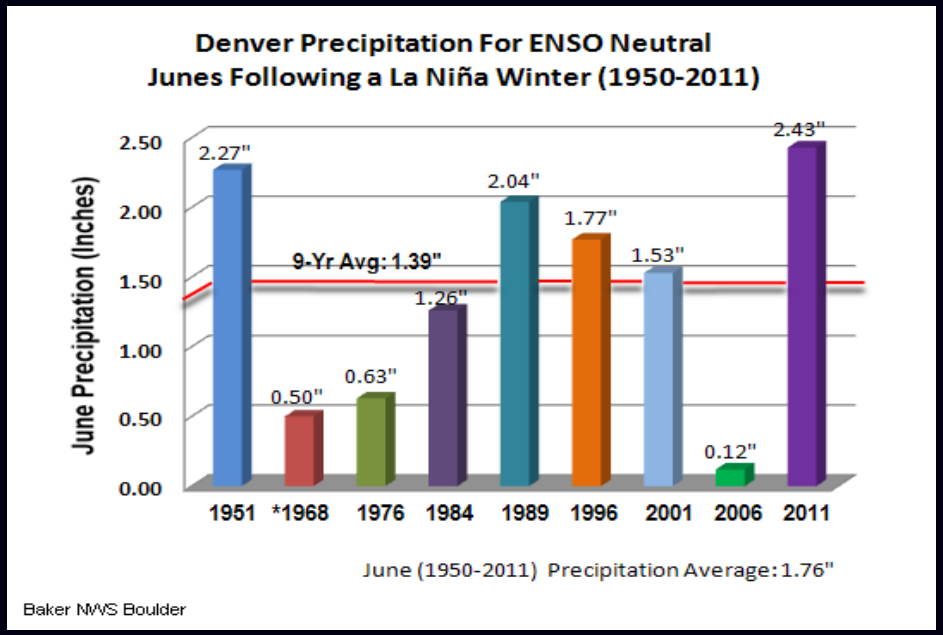
This mid-summer spike in precipitation frequency is largely the result in a marked increase in thunderstorms during the so-called ***summer monsoon***.

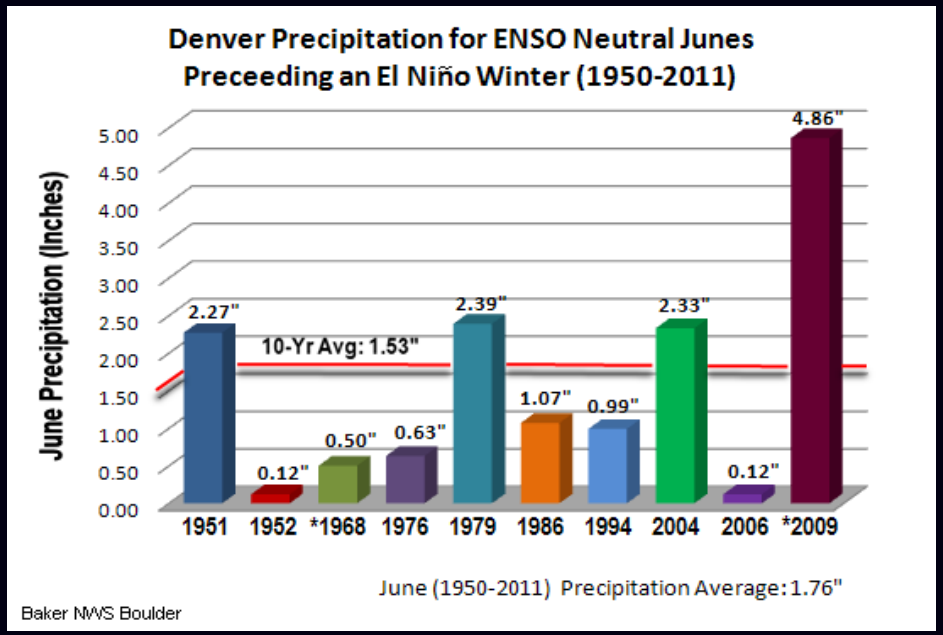
A precipitation minima is visible on these plots in early summer (mid June-early July) at both locations. This period of comparative dryness is often accompanied by some of the warmest temperatures of the summer. It is not uncommon to see a marked increase in the wildland fire danger during this period.

June Precipitation During ENSO Neutral Conditions



Since 1950, June precipitation in Denver, Colorado has been highly variable during ENSO neutral conditions. During the 33 Junes since 1950 when neutral ENSO conditions were present, average monthly precipitation varied from a very low of 0.09 inch in 1980 to an impressive high of 4.86 inches in 2009! However, the average precipitation for all 33 Junes during ENSO neutral conditions was a mere 0.10 inch below the average for all Junes since 1950.



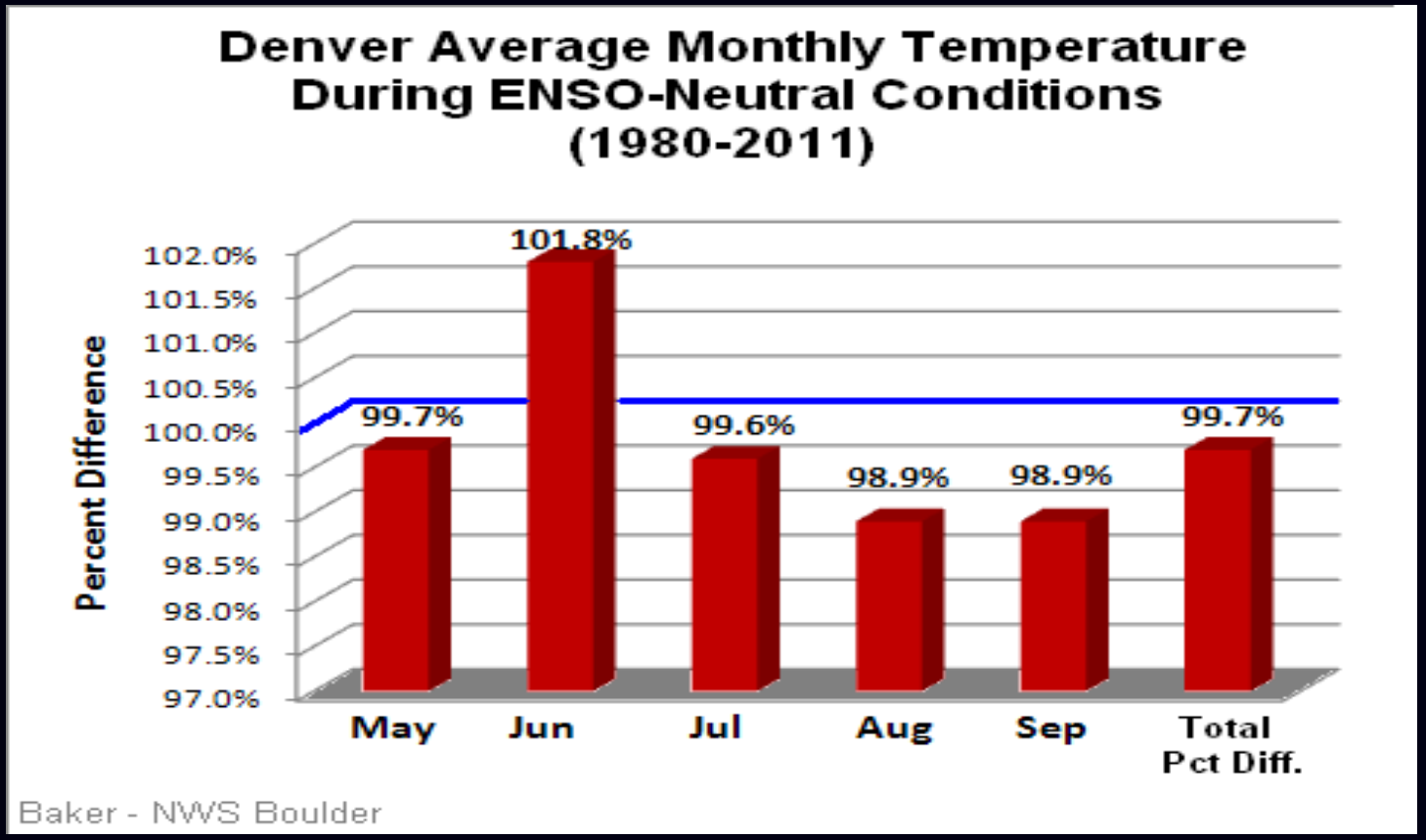


Two questions often asked; “How much precipitation do we normally see in Denver in the month of June during ENSO neutral conditions following a La Niña, and prior to an El Niño?

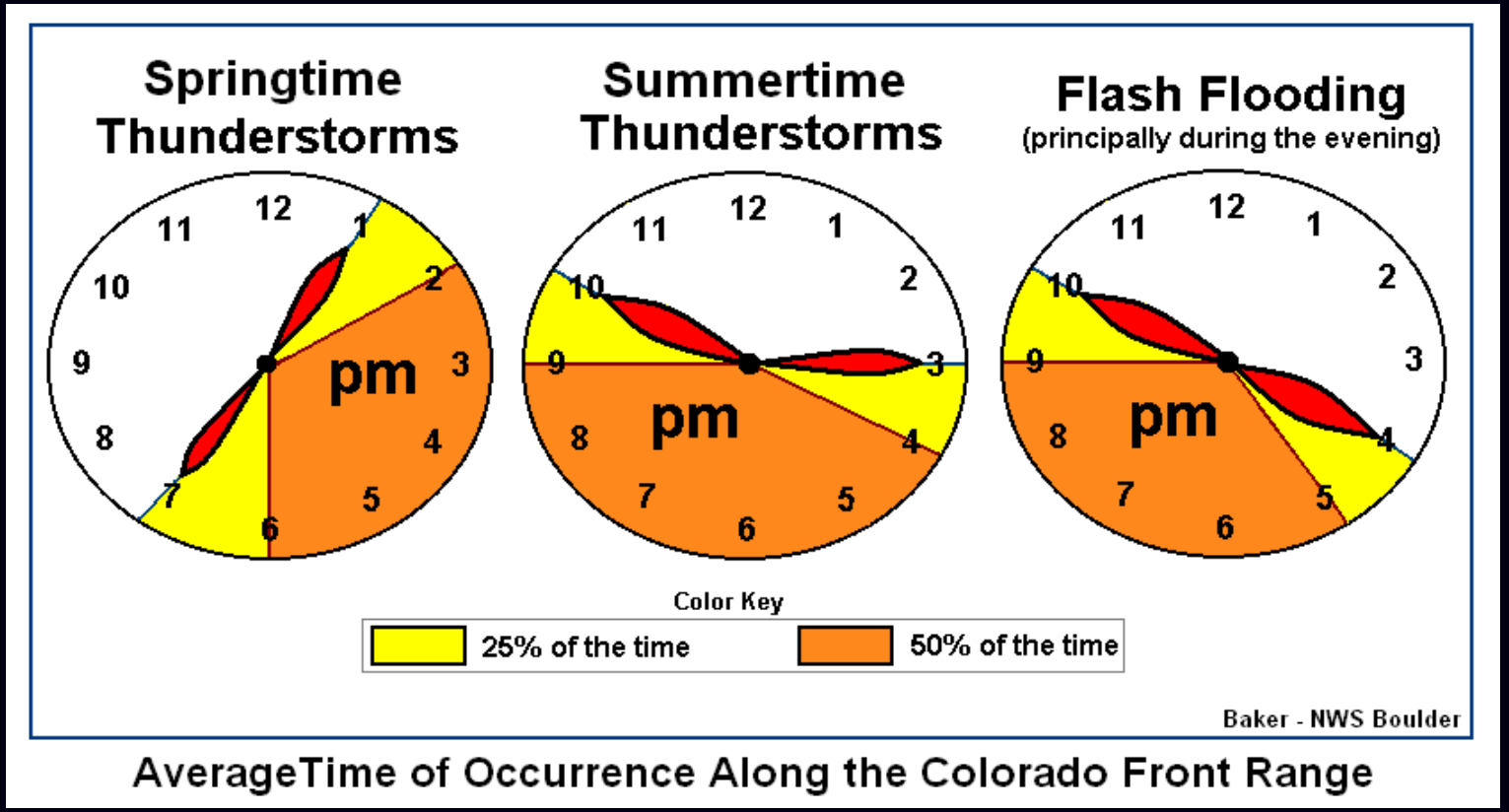
Unfortunately, the number of Junes since 1950 matching these scenarios is quite small. However, using data from nine Junes to answer the first question, and ten Junes to answer the second, there does not seem to be any clear answers to these questions.

Although when averaged together, June precipitation at Denver for both situations is slightly lower than the average for all Junes from 1950-2011.

June Temperatures During ENSO-Neutral Conditions



How about temperature in Denver during ENSO neutral summers (May-September)? Based on 19 separate years since 1980, it is revealed above that the average monthly temperature for May, July, August and September was slightly below average, and slightly above average for June. The overall monthly average for these five months was very close to average (99.7%).



AverageTime of Occurrence Along the Colorado Front Range

During May and June, convection (i.e., thunderstorms) is likely to form first over the sun drenched east facing slopes of the Front Range late in the morning and early afternoon. These storm cells then move generally east over the adjacent high plains where they may initiate new storms later in the afternoon. (left diagram)

During July and August, thunderstorms development over and along the Front Range in northeast Colorado commonly occurs later in the afternoon. Thunderstorms on the plains also are more likely to linger well into the evening. (middle diagram)

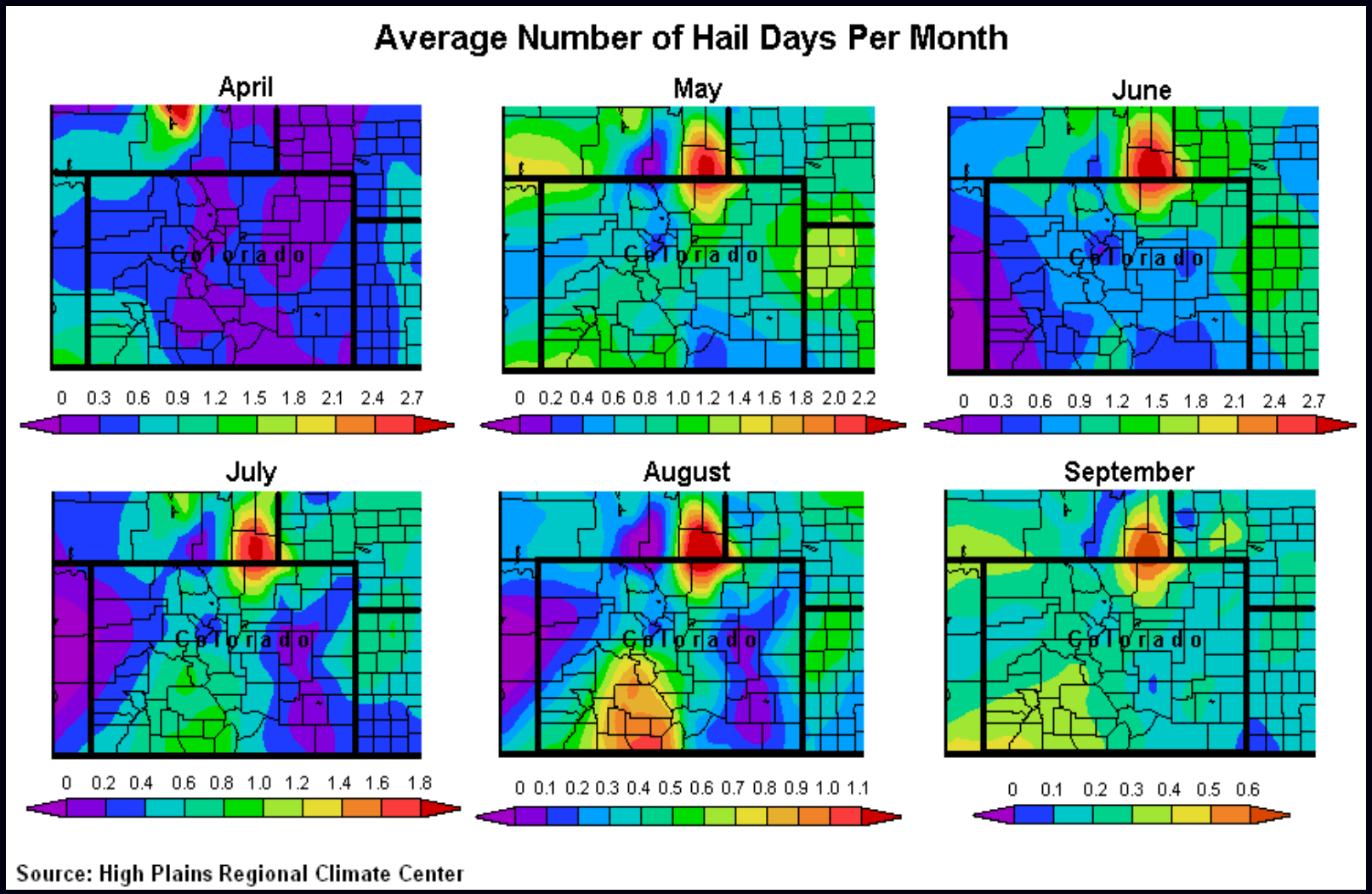
Flash Flooding - Thunderstorms, particularly those associated with the summer monsoon in July and August, are more likely to produce intense rainfall potentially resulting in flash flooding. This occurs more often during the late afternoon and evening hours when precipitable water is greater and steering winds are lighter. (right diagram)

The Hail Season is Upon Us

Hail poses a serious danger to life and property, especially when driven by powerful thunderstorm winds.

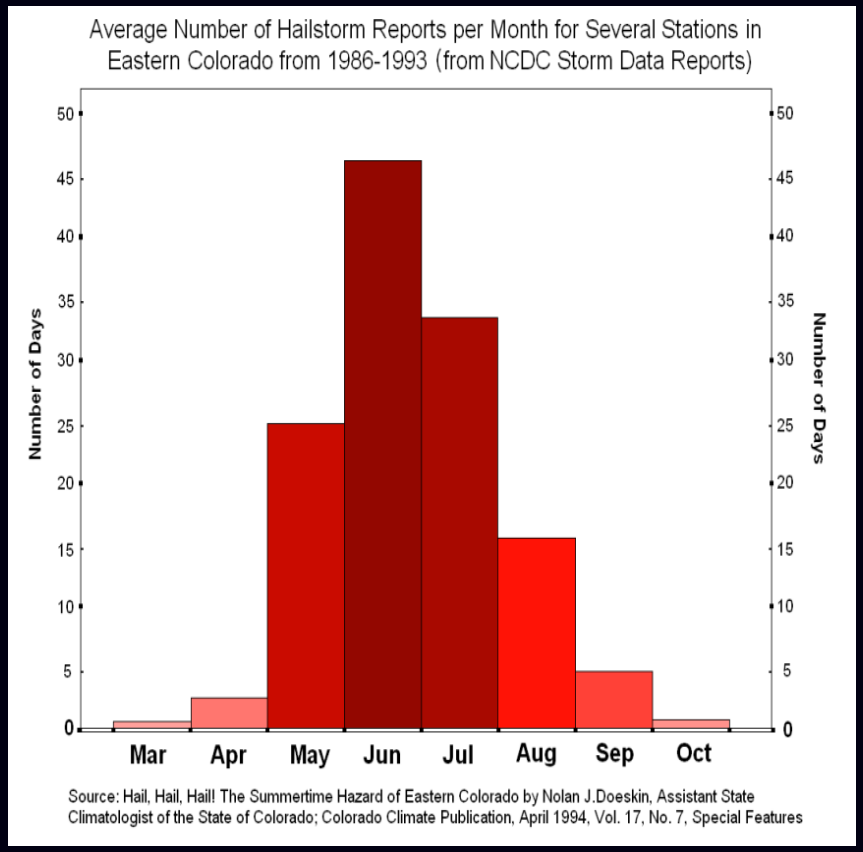
The lee side of the Rocky Mountains, specifically northeast Colorado, southeast Wyoming and western Nebraska experience the greatest frequency of hail, the largest average hailstone sizes and the longest hail storm durations in the nation, making this region the “hail capital of North America.”.

Stanley A. Changnon, David Changnon and Steven D. Hilberg, “Hailstorms Across the Nation – An Atlas About Hail and Its Damages”, Illinois State Water Survey, Champaign, IL November 2009

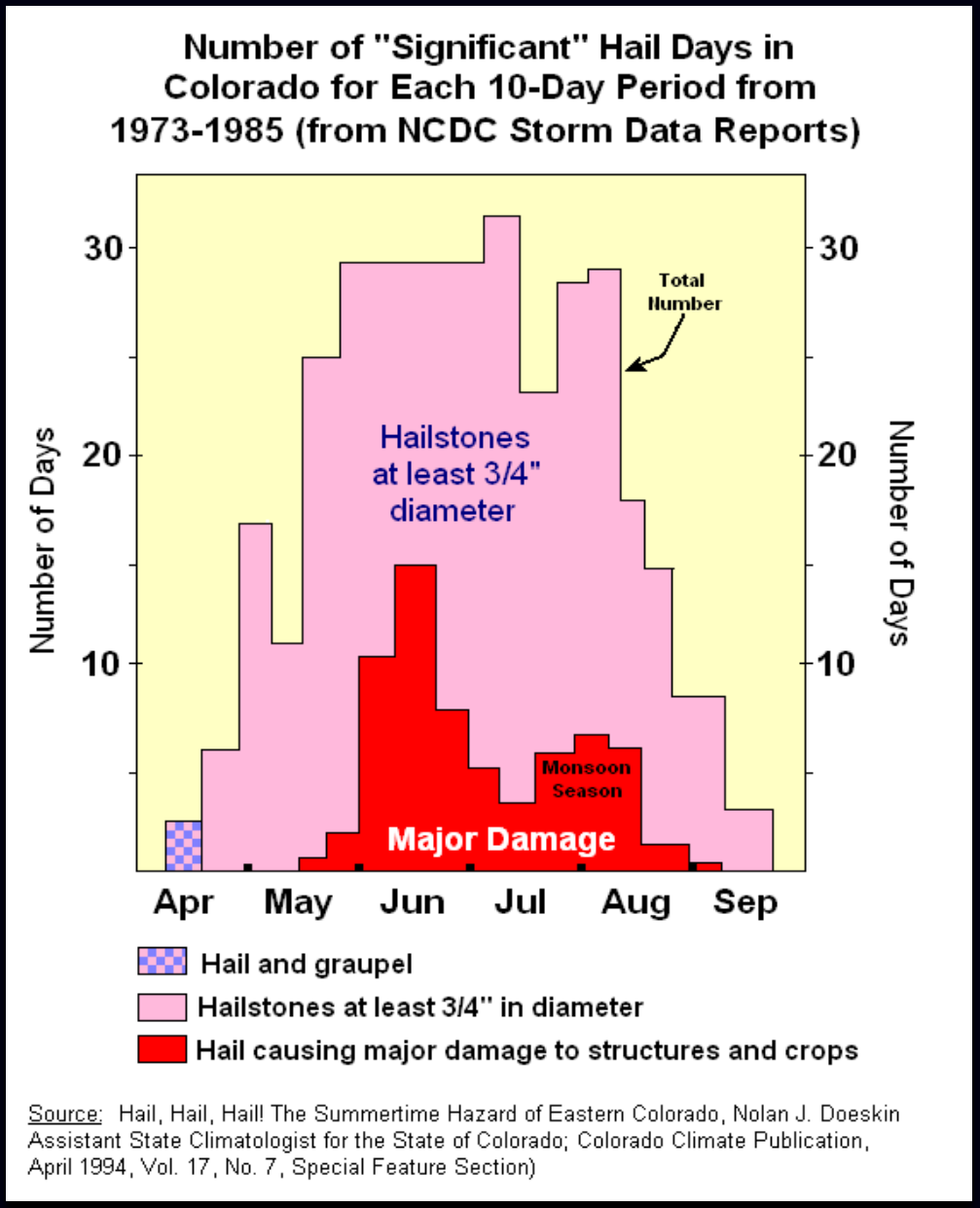


Cheyenne, Wyoming and its surroundings, including northeastern Larimer and northern Weld Counties in northern Colorado, are at the center of the “Hail Capital of North America”.

Other areas with a high frequency of hail days during the summer season include northwest Kansas, western Nebraska, as well as southwest and northeast Colorado including the elevated terrain between Denver and Colorado Springs known as the Palmer Divide.



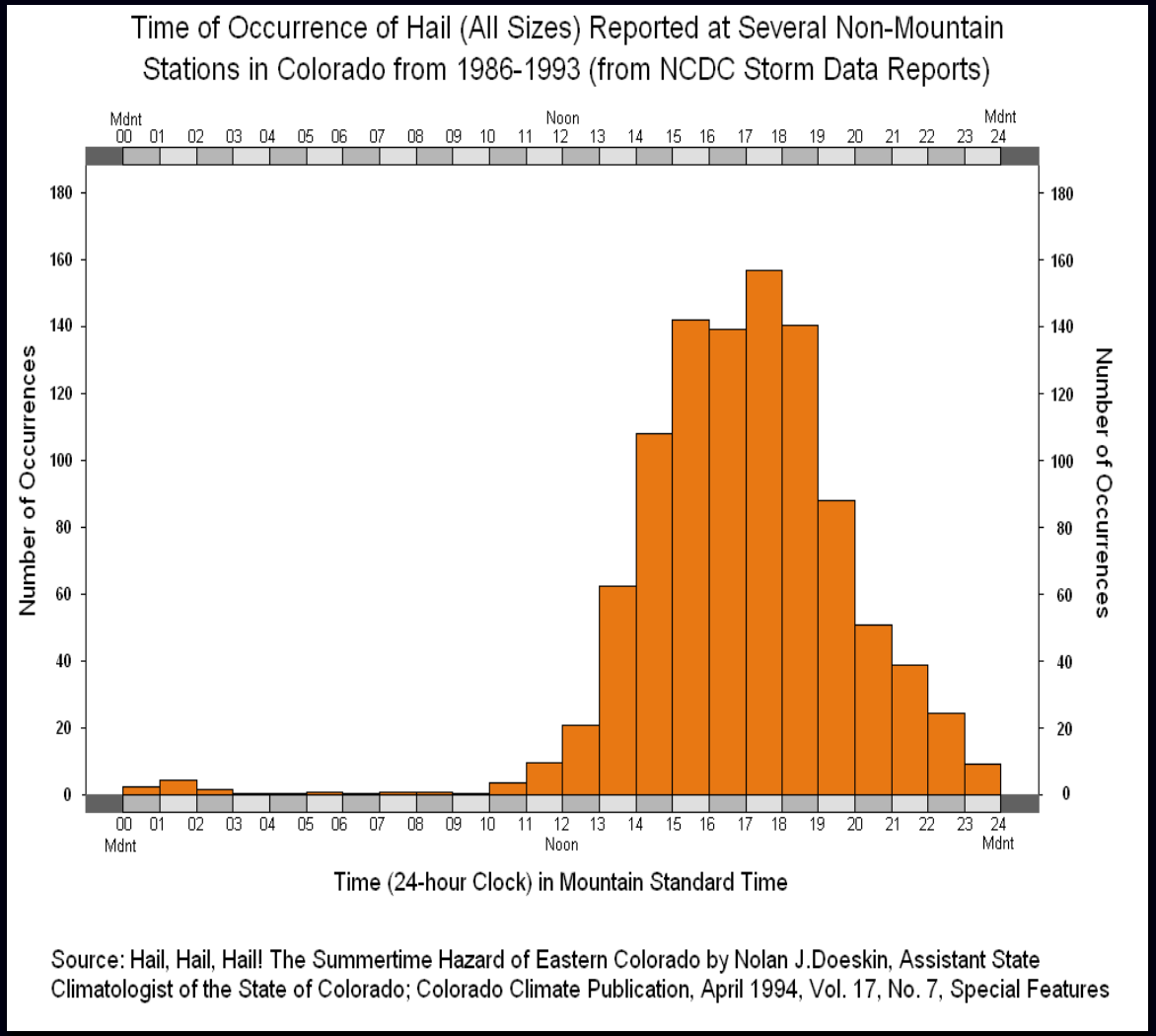
The hail season in eastern Colorado runs generally from late April through early September, with it peaking during the month of June. By August, hailstorm frequency decreases significantly as the late summer atmosphere becomes drier and more stable.



The average number of "significant" hail days reported in Colorado (days when thunder-storms produce hailstones of at least ¾ inch in diameter), increases dramatically during the latter half of May, and peaks during the months of June and July. Hail falling during June and early July, on average, results in the lion's share of major damage to property and crops in eastern Colorado.

A second peak in damaging hail storms (see diagram) in late July and early August is associated with elevated thunderstorm activity during the summer monsoon." Though hailstones may be larger in size during this period, the extent of damage they cause is usually not as great.

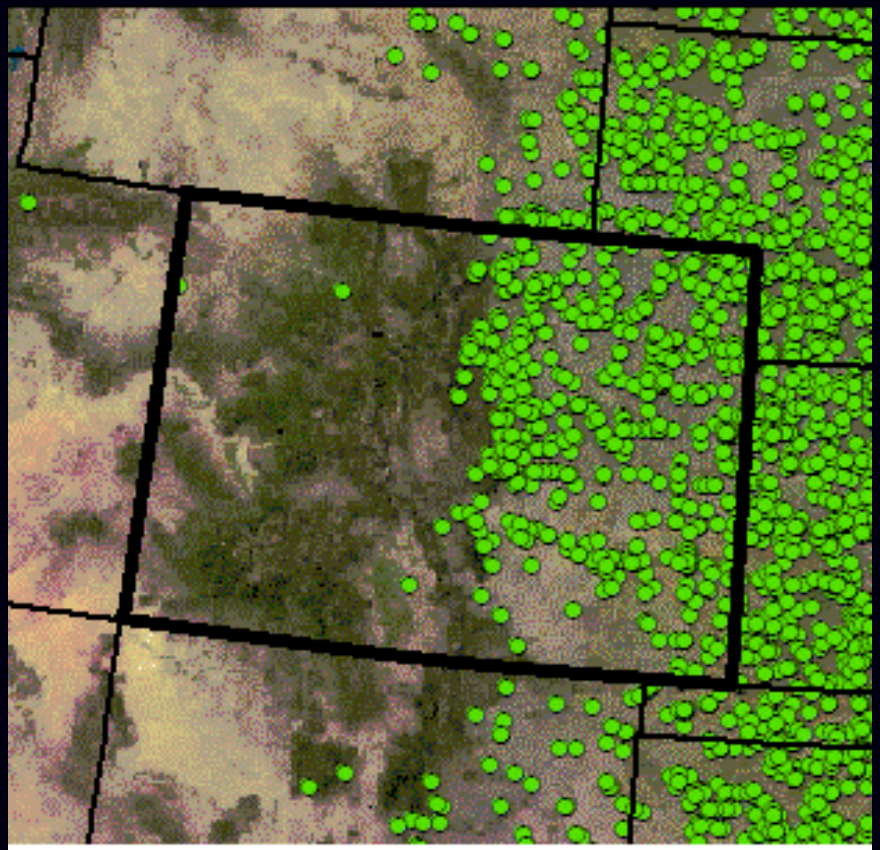
The Occurrence of Hail Producing Thunderstorms



Source: Hail, Hail, Hail! The Summertime Hazard of Eastern Colorado by Nolan J.Doeskin, Assistant State Climatologist of the State of Colorado; Colorado Climate Publication, April 1994, Vol. 17, No. 7, Special Features

Thunderstorms in Colorado often form first over the solar heated slopes of the mountains around midday, before venturing out over the surrounding plains and valleys. This initial wave of convection (thunderstorms) may then produce outflow boundaries that serve to initiate further storm development on the plains.

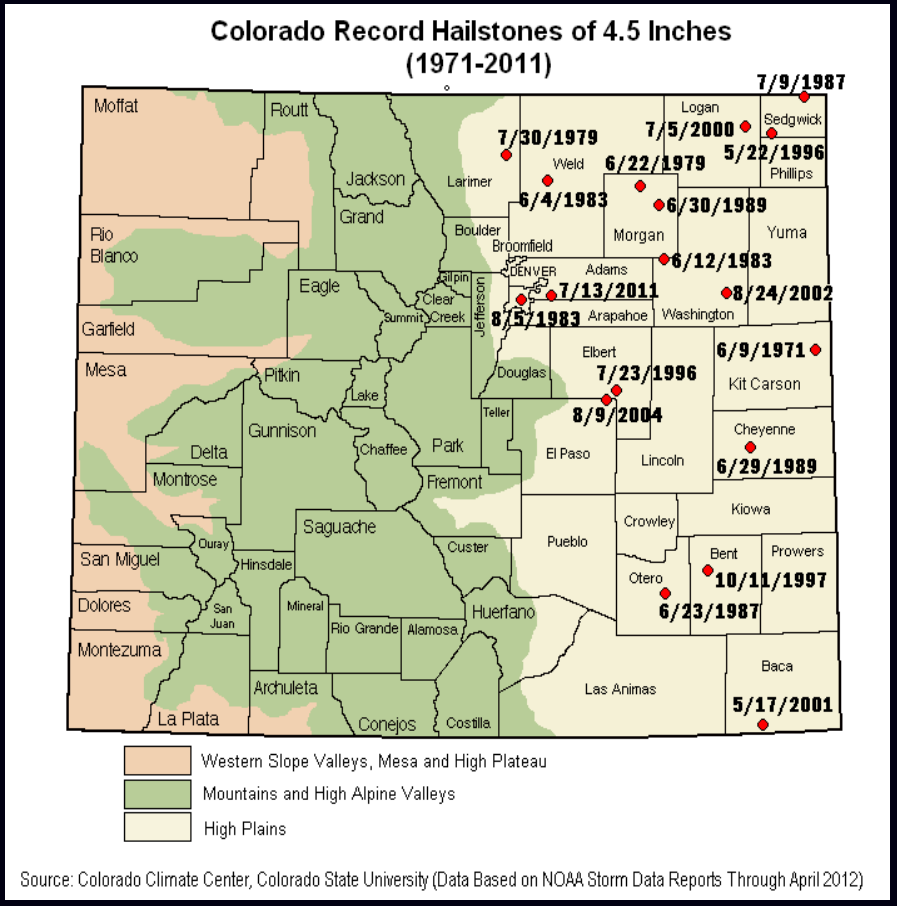
In a hail study conducted by Nolan Doeskin, at the time the Assistant State Climatologist for the State of Colorado, it was determined that hail producing thunderstorms in non-mountain locations of Colorado are more likely to occur in late afternoon during maximum solar heating. (see diagram at left)



NOAA/NWS Severe Storms Prediction Center

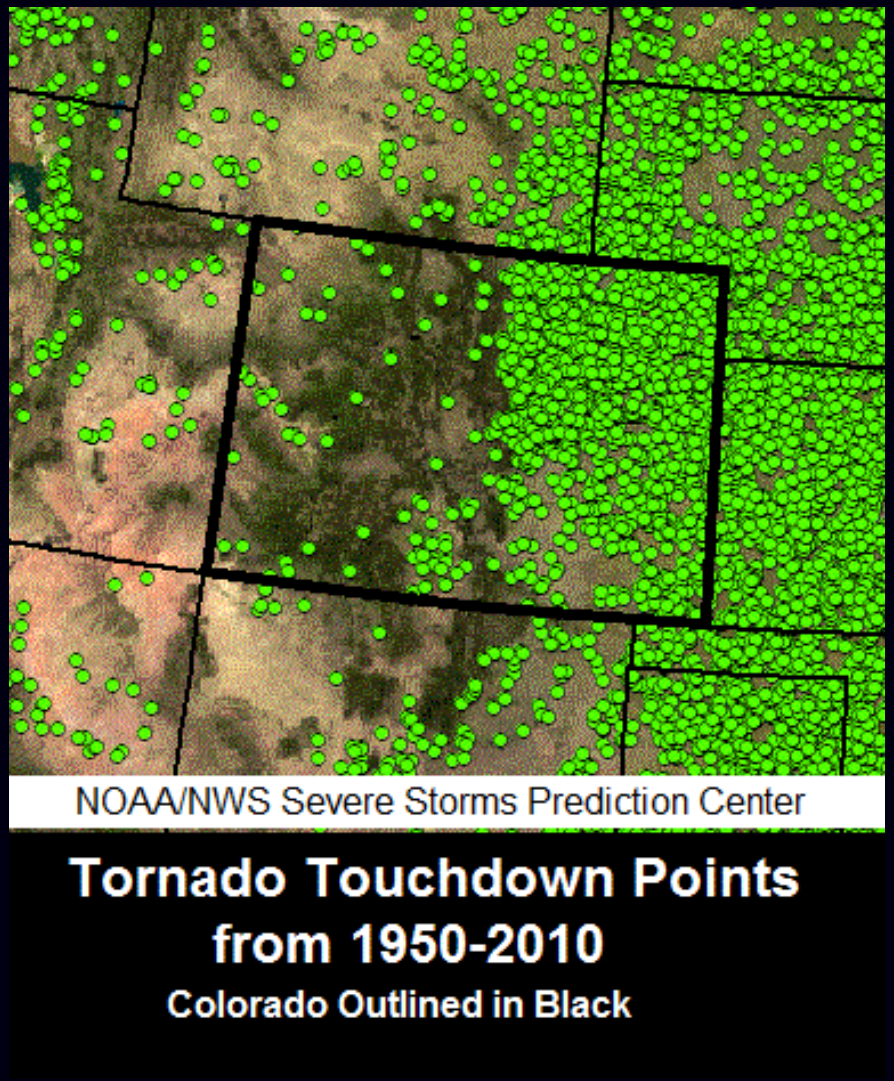
Significant Hail - 2 Inches and Greater 1955 to 2010

Colorado Outlined in Black



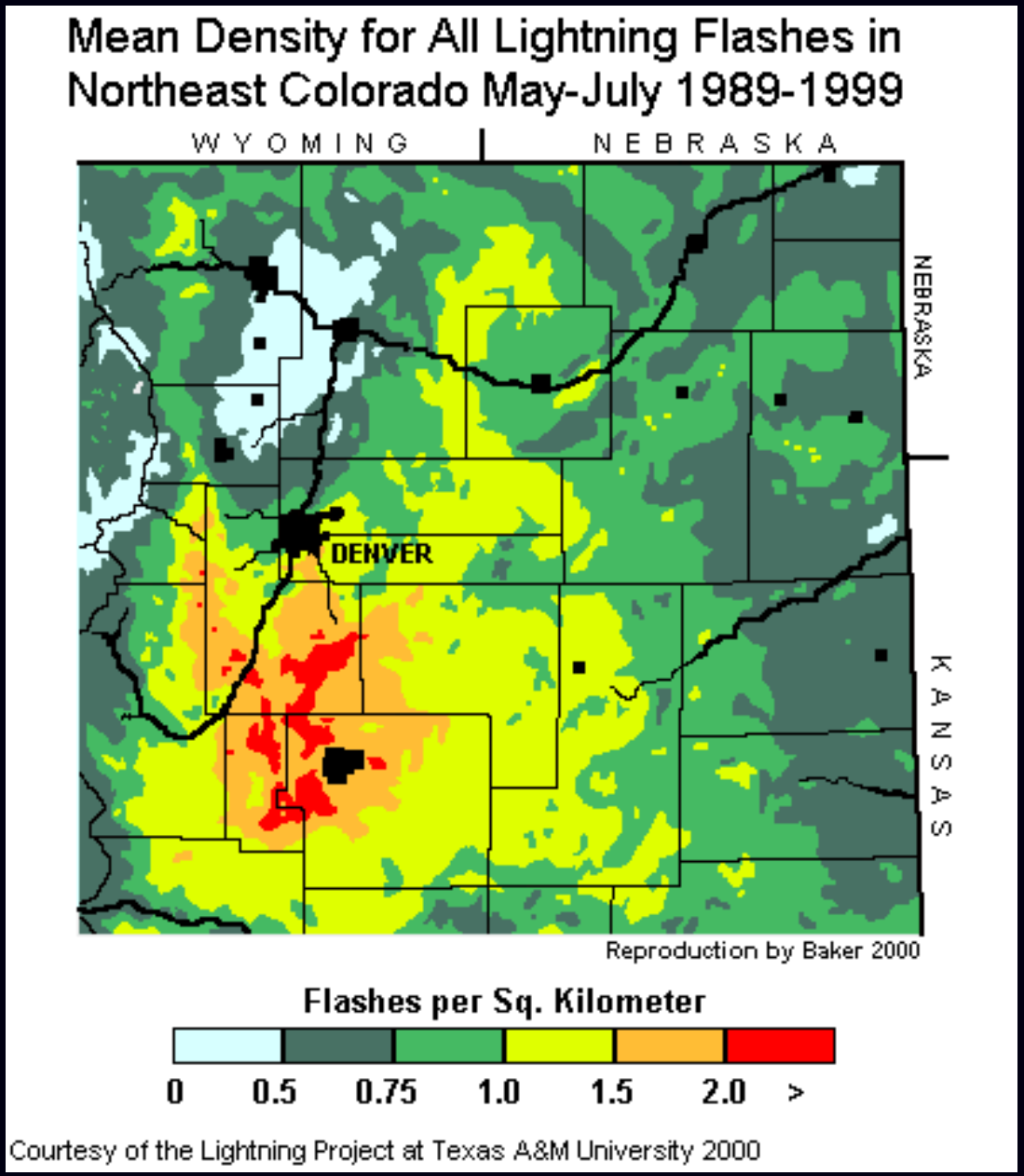
Source: Colorado Climate Center, Colorado State University (Data Based on NOAA Storm Data Reports Through April 2012)

Dates of Significant Hail – 4.5 Inches in Diameter 1971-2011



Colorado, especially eastern parts of the state, has seen its share of tornadoes since 1950.

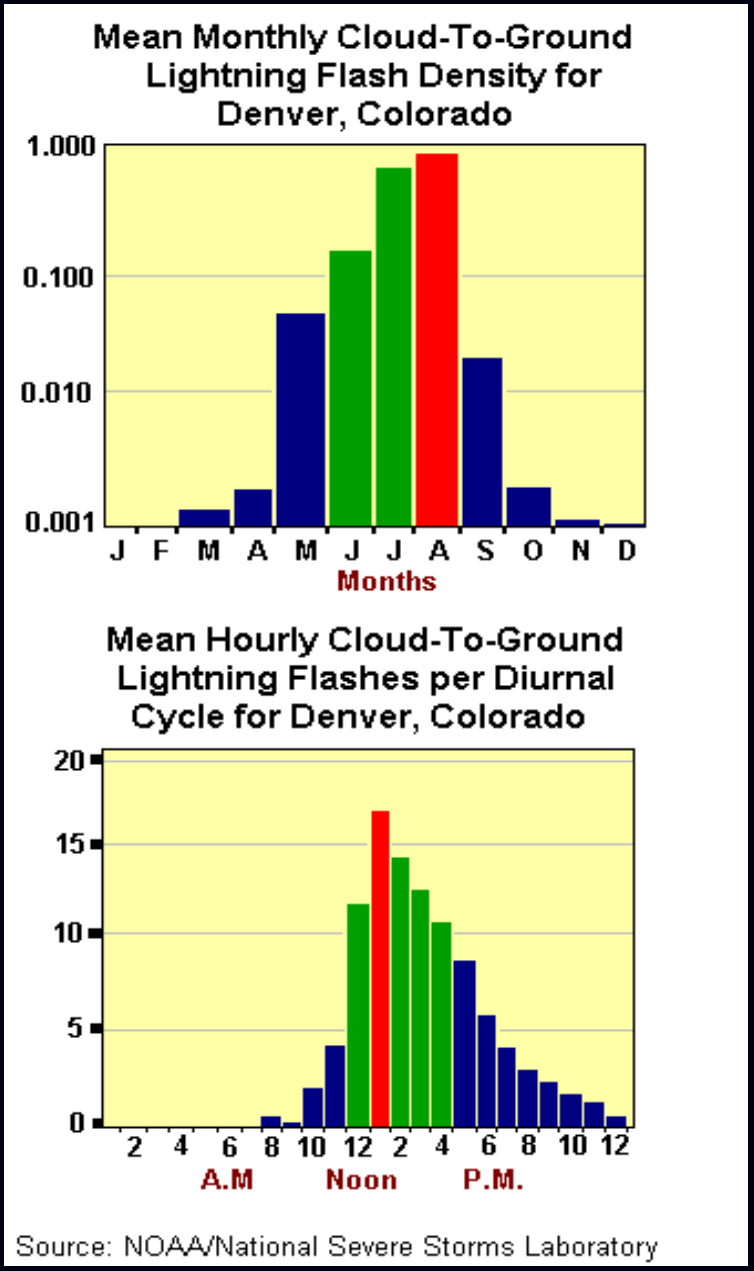
The cluttering of tornadoes in northeast Colorado may be attributed to a greater population density in this part of the state.



In a study conducted by the Texas A&M University during 1989-1999, it was found that the greatest concentration of lightning flashes in northeast Colorado occurred over the elevated terrain known as the Palmer Divide or Monument Ridge between Denver and Colorado Springs.

The least lightning activity (positive and negative flashes) was documented over northern portions of the Front Range urban corridor around the cities of Loveland, Greeley and Fort Collins.

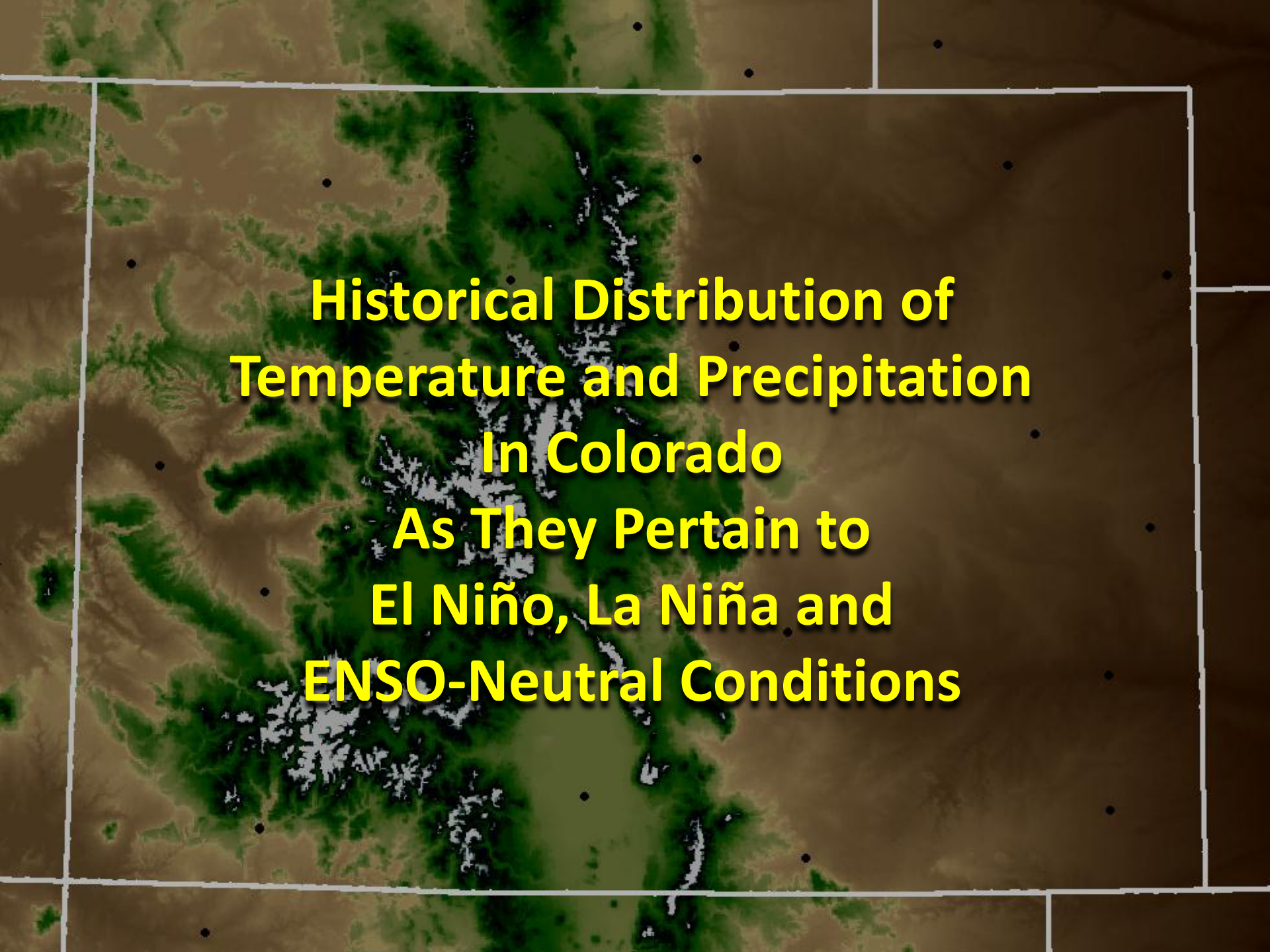
The Lightning Threat Along the Colorado Front Range



Along the Front Range in northern Colorado, lightning frequency increases steadily during the months of May, June and July, and peaks on average, during the month of August.

Lightning occurrence in the Denver area peaks, on average, early in the afternoon with the initial wave of thunderstorms moving off the Front Range. Lightning frequency will then decrease normally through the afternoon as storms move away from the Front Range.

However, lightning in the Denver area is more likely to occur later in the day as we move further into summer. This is largely due to increased warming aloft which can delay or even inhibit the formation of thunderstorms.


Historical Distribution of
Temperature and Precipitation
In Colorado
As They Pertain to
El Niño, La Niña and
ENSO-Neutral Conditions

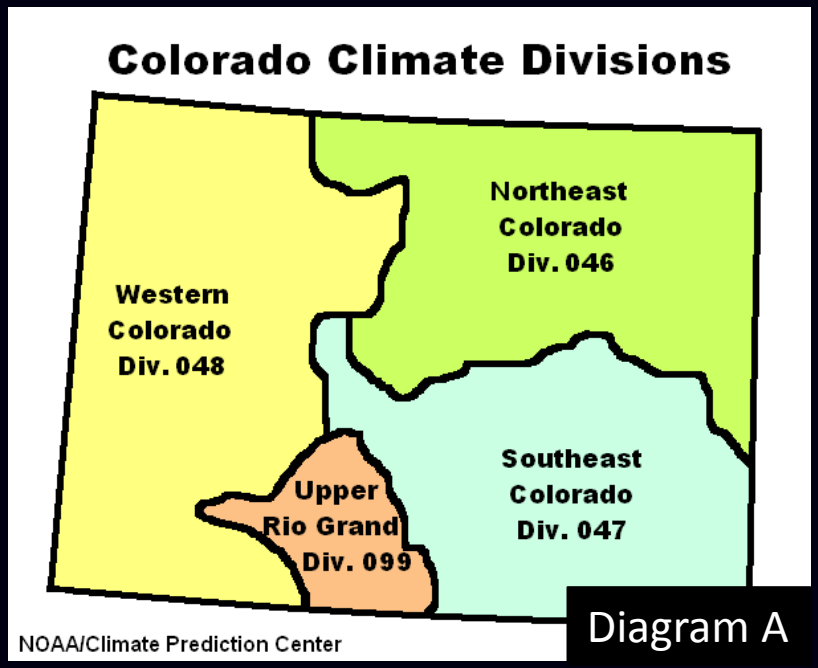


Diagram A

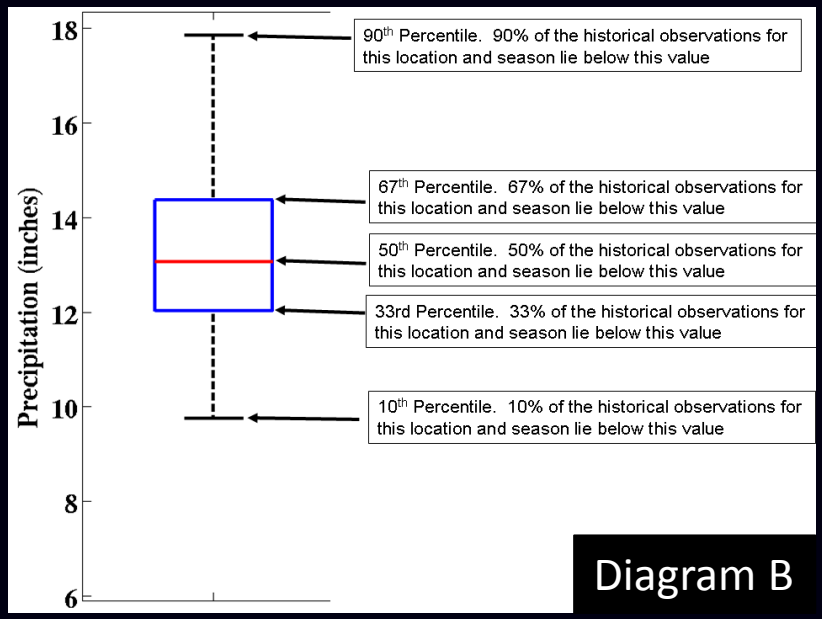


Diagram B

Interpreting ENSO Box and Whisker Plots

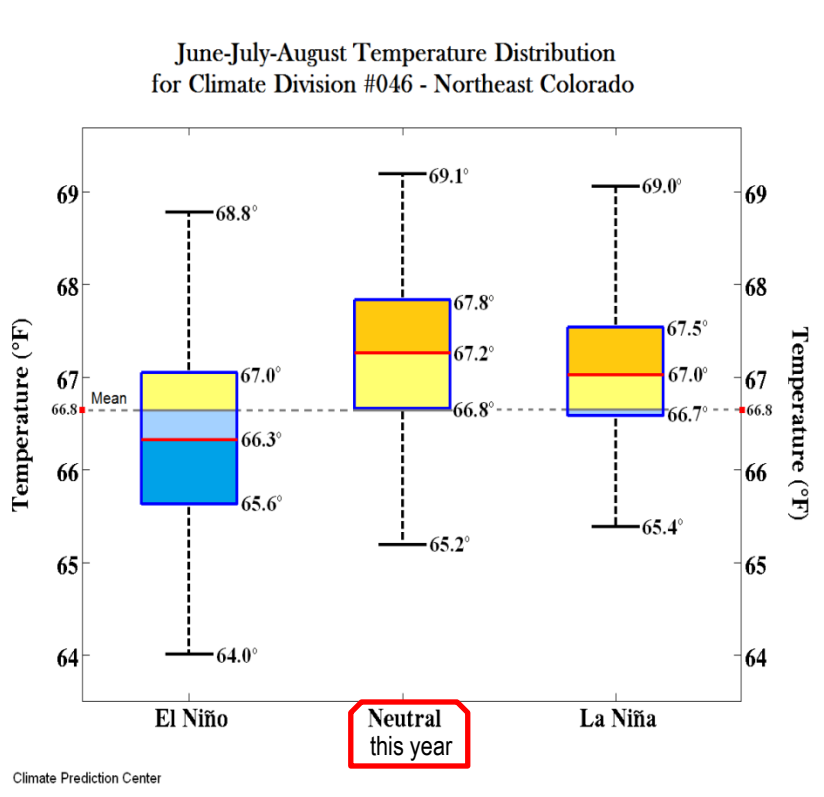
Diagram A is a map of the four climate mega-divisions in Colorado used by the Climate Prediction Center (CPC)—Divisions 046, 047,048 and 099.

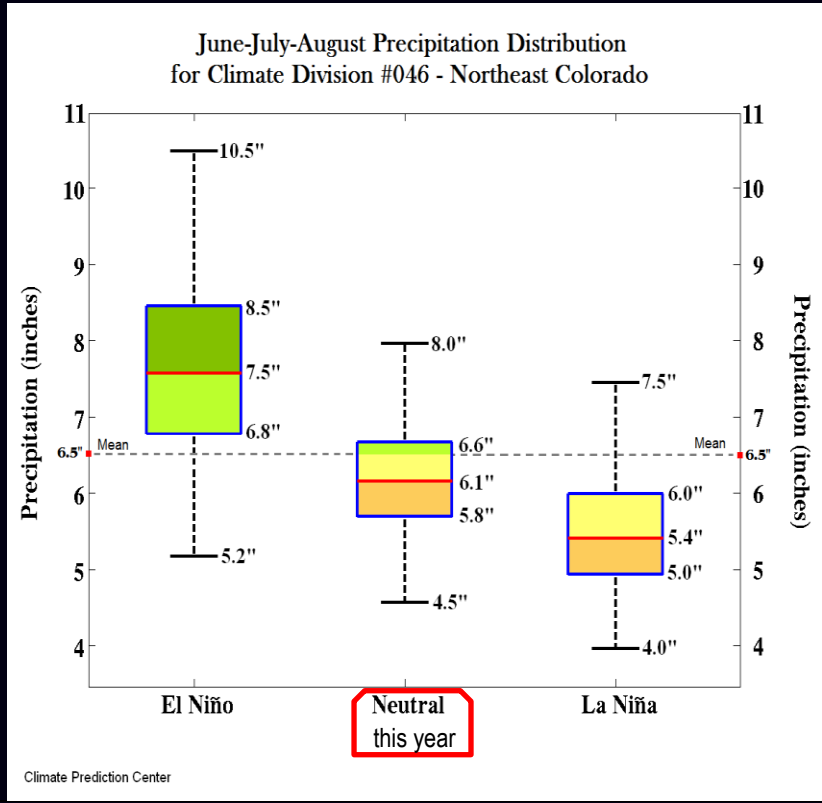
CPC has produced 3-month historical temperature and precipitation distribution plots for the three different ENSO categories –El Niño, La Niña and ENSO-neutral (non-ENSO) conditions for every climate mega-division in the United States.

Diagram B is a description of the ENSO box and whisker analysis plot used by CPC to represent historical temperature and precipitation distributions for each ENSO category pertaining to each climate division.

The red line inside the ENSO box represents the mean or 50th percentile of the data (temperature or precipitation) distribution for each climate division. Approximately 34% of the total observations exist within the ENSO box, and the remaining observations (about 66%) lie outside of the box along the whiskers extending above and below the box.

ENSO Box and Whisker Analysis Plots for the Northeast Colorado Climate Division #046 for the 3-Month Climate Season of June-July-August

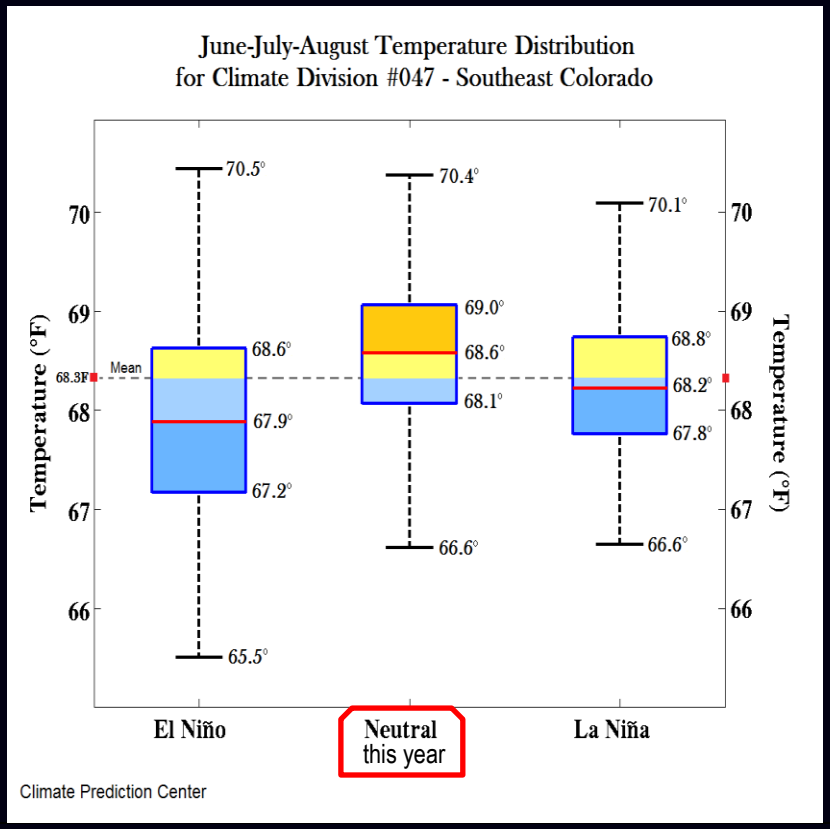




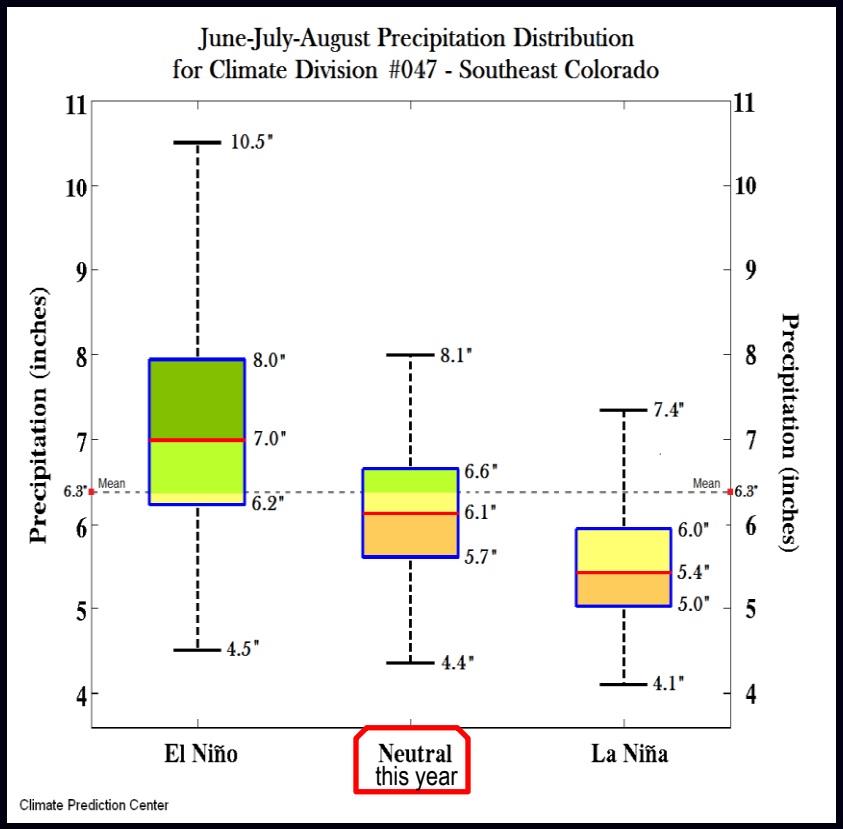
For the climate season June, July and August, temperatures in northeast Colorado historically have been slightly below average during El Niño conditions, above average during neutral ENSO conditions and slightly above average during past La Niña events.

For the same three months, precipitation historically was above average during El Niños, slightly below average during neutral ENSO conditions, and below average during La Niñas. Note, these climate distributions do not take into account the strength of the ENSO (El Niño/La Niña) event.

ENSO Box and Whisker Analysis Plots for the Southeast Colorado Climate Division #047 for the 3-Month Climate Season of June-July-August

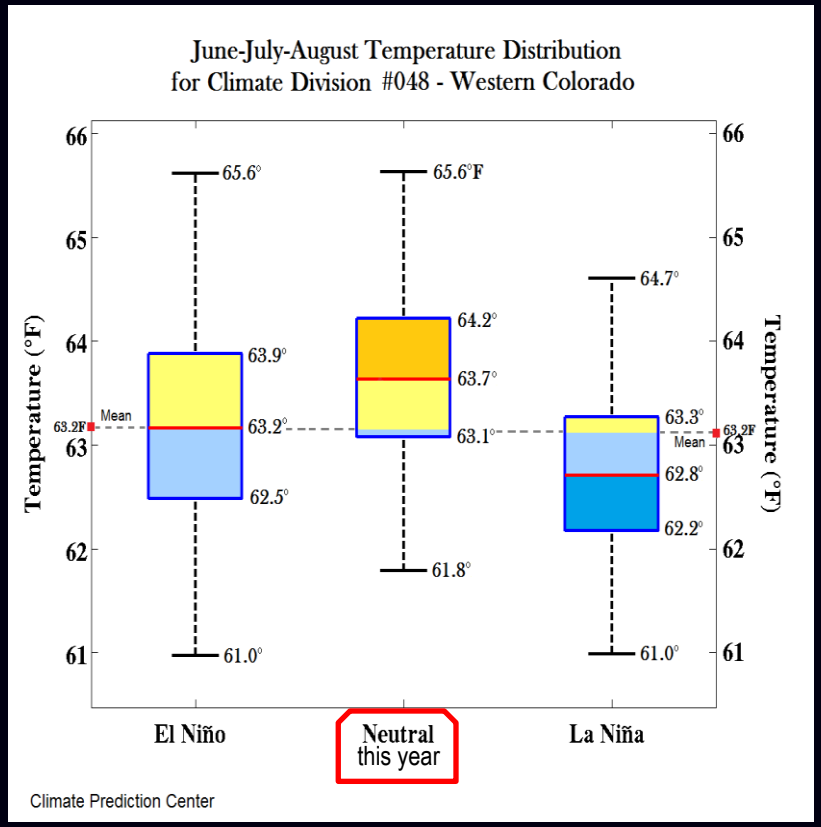


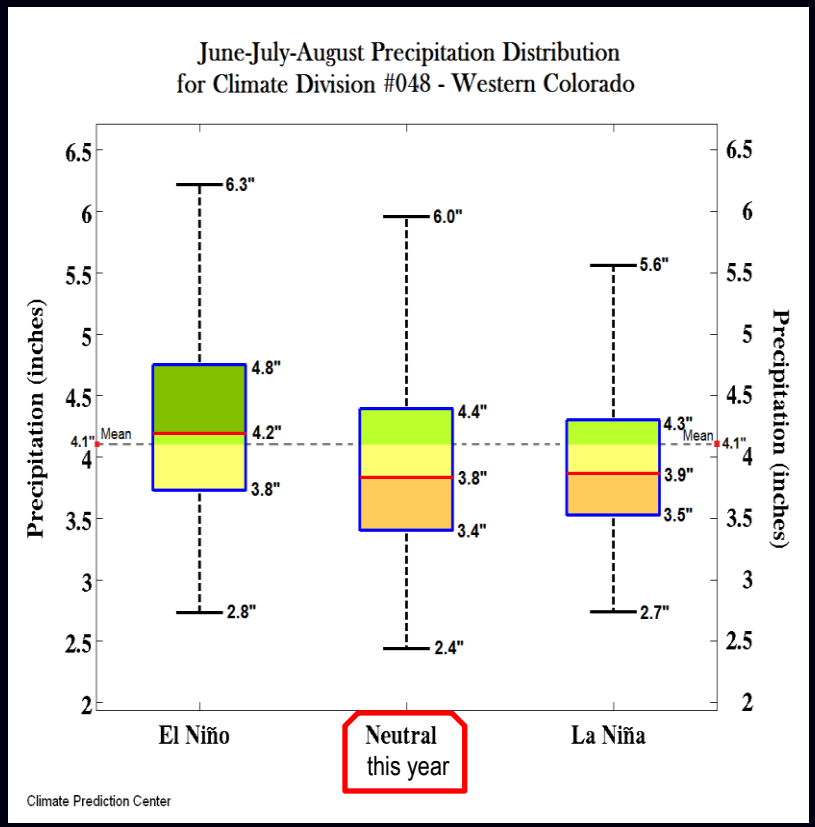
For the months of June, July and August, temperatures for southeast Colorado historically have been slightly below average during El Niño events, and slightly above average during neutral ENSO conditions, and near average during La Niña conditions.



For the same three month period, precipitation was above average during El Niño events, near average during ENSO-neutral conditions, and below average during La Niña conditions.

ENSO Box and Whisker Analysis Plots for the Western Colorado Climate Division #048 for the 3-Month Climate Season of June-July-August





Temperatures in western Colorado during the months of June, July and August historically have been near average during El Niño events, slightly above average during neutral ENSO conditions, and slightly below average during La Niña conditions.

Finally, precipitation during this same three month period historically was near average during El Niño events, and slightly below average during ENSO-neutral and La Niña conditions.

June-July-August 2012 Temperature and Precipitation Outlook for Colorado Prepared by NOAA's Climate Prediction Center

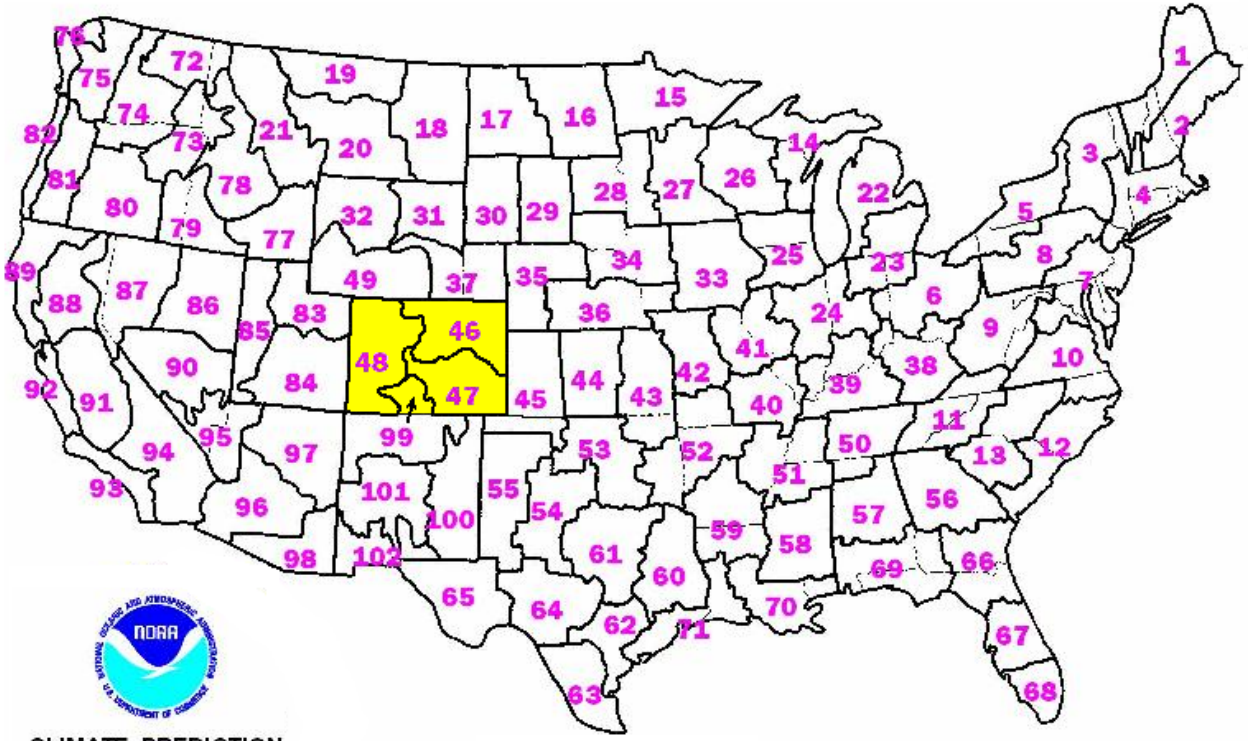
Baker - National Weather Service Boulder, Colorado

Climate Prediction Center Seasonal Outlooks

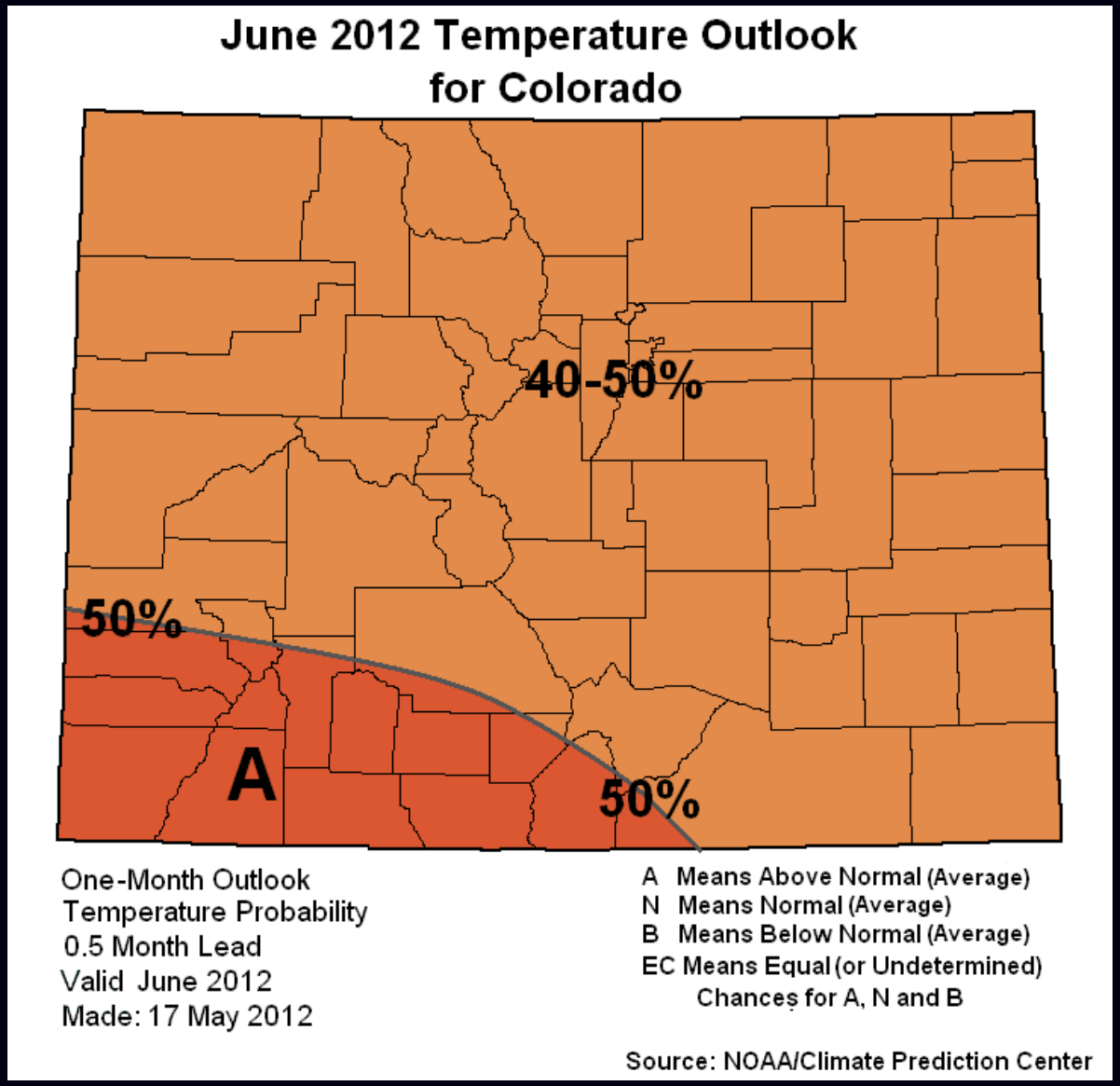
The National Weather Service Seasonal Climate Outlooks predict the probability of conditions being among the warmest/coldest or wettest/driest terciles of years compared to the period of record 1981-2010.

The outlooks indicate probability of being in three specific categories in reference to the 30-year climatology from 1981-2010. They are above, below and average.

Remember, Climate Predicition Center (CPC) outlooks are made at the scale of the climate megadividions (see the map below).

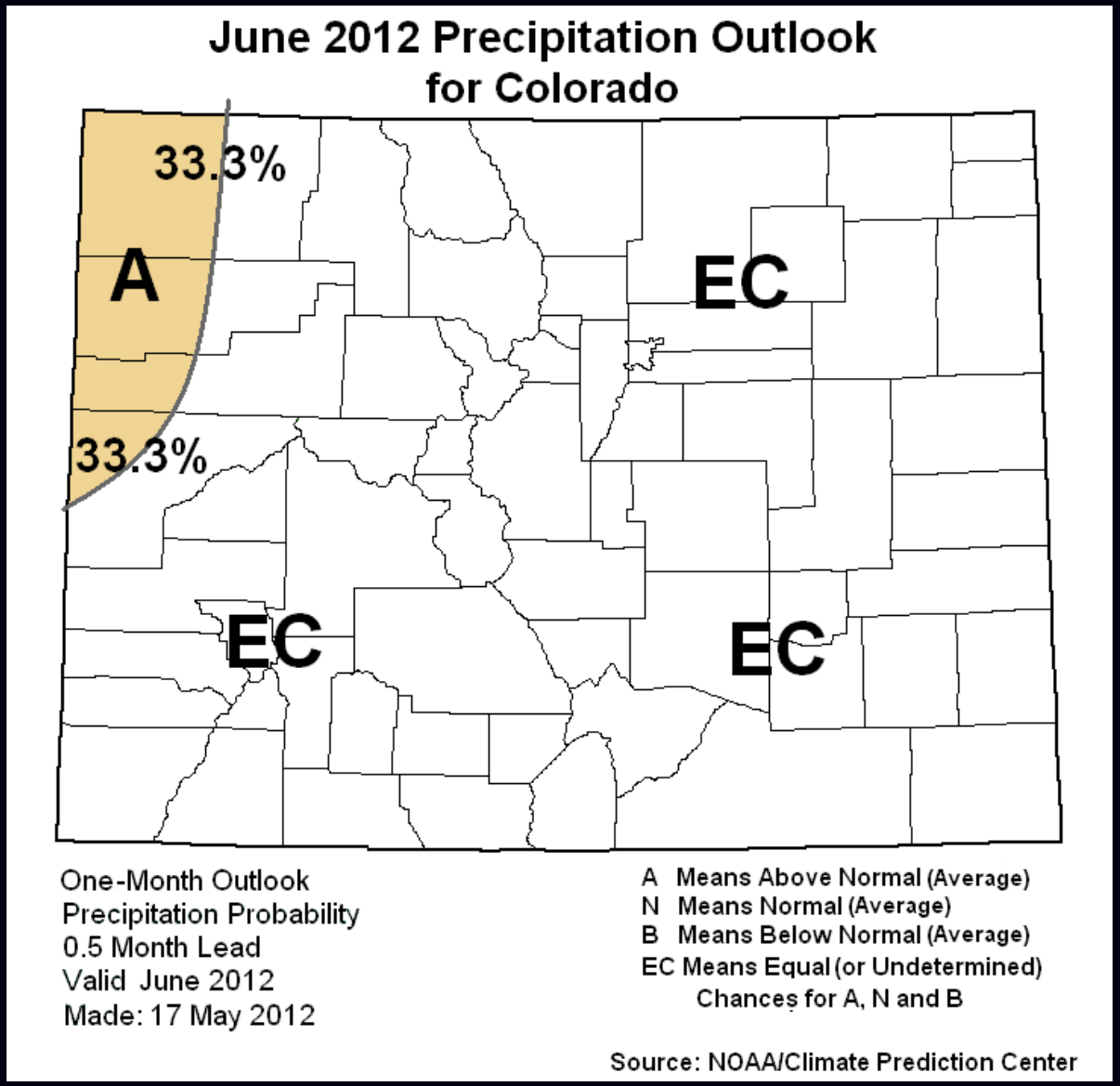


Remember:
CPC outlooks do not infer any degree of warmness or coldness, or any quantity of precipitation; ***only*** their probability of occurrence.



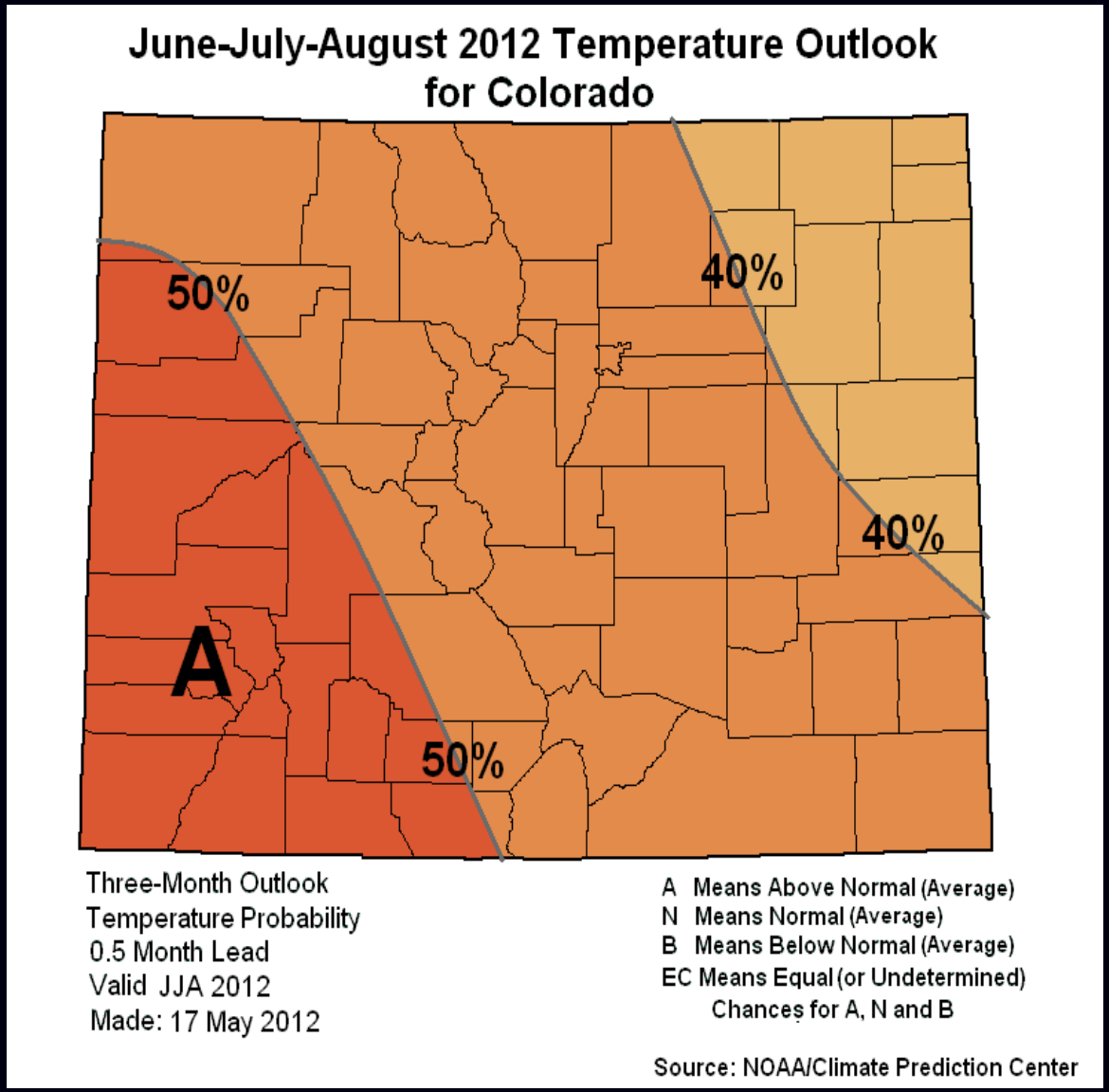
June 2012 Temperature Outlook for Colorado

The temperature outlook for June calls for a 40 to 50 percent chance of above average temperature for all except the southwest corner of Colorado. The remaining section of the state has a 50-60% chance of above average temperature during the month of June according to NOAA's Climate Prediction Center.



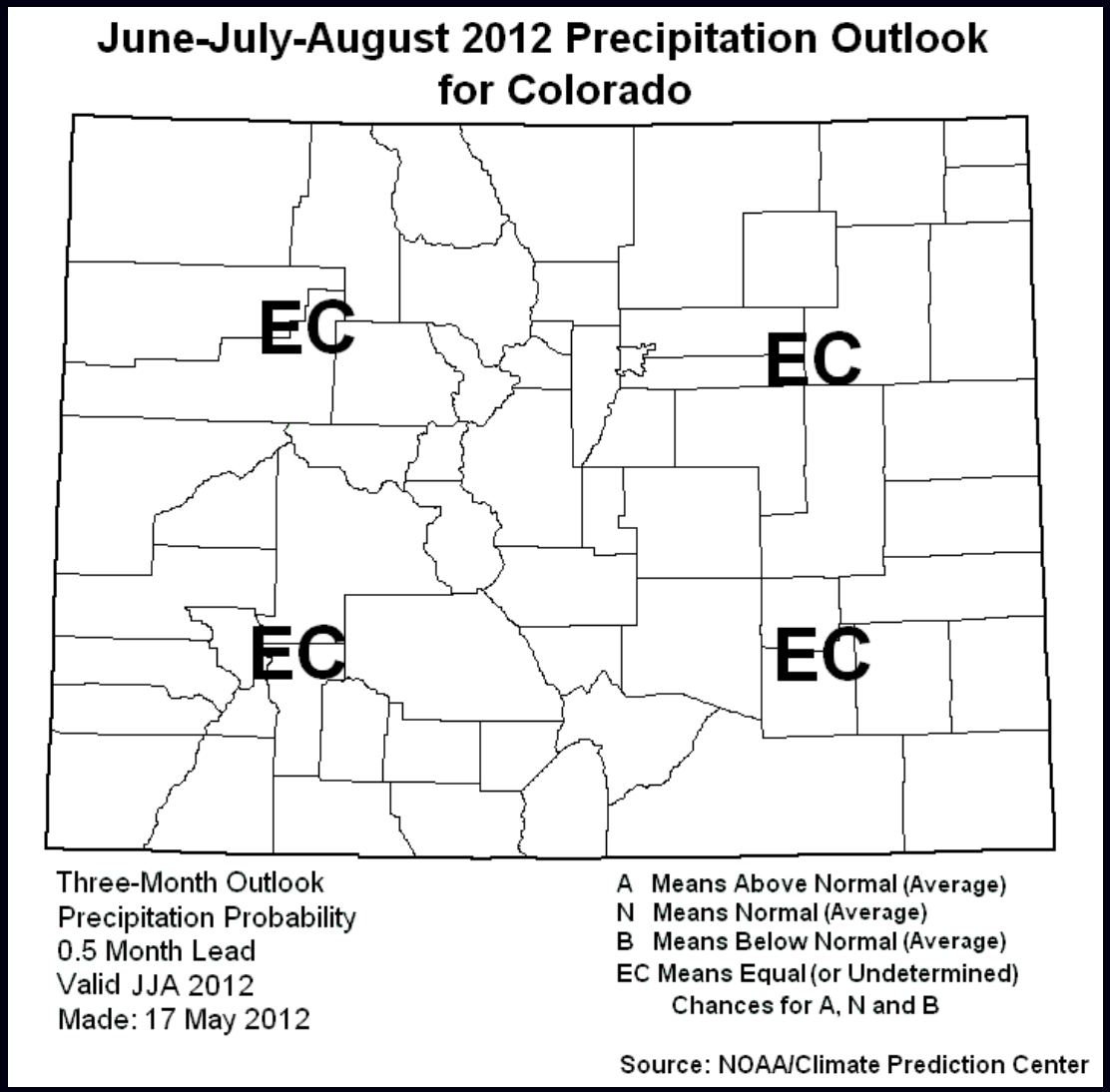
June 2012 Precipitation Outlook for Colorado

The precipitation outlook for June calls for an equal or undetermined chance (EC) of above, below and near average precipitation for all except the extreme northwest corner of Colorado. The remaining section of the state has a 33.3 to 40 percent chance of above average temperature during June according to NOAA's Climate Prediction Center.



June-July-August 2012 Temperature Outlook for Colorado

The temperature outlook for the months of June, July and August calls for a 33.3 to 40 percent chance of above average temperature across the northeast corner of Colorado, a 40 to 50 percent probability of above average temperature for central portions of the state, and a 50 to 60 percent chance of above average temperature for the southwest quarter of Colorado.



June-July-August 2012 Precipitation Outlook for Colorado

CPC's precipitation outlook for June, July and August calls for an equal or undetermined chance (EC) of above, below and near average precipitation for all of Colorado.